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A JOURNEY TO THE SUMMIT OF MOUNT KENYA, BRITISH EAST AFRICA.*

By H. J. MACKINDER, M.A.

In East Africa stand two snow-capped mountains, extinct volcanic cones, whose names have been known for fifty years—Kilimanjaro and Kenya. They are about 200 miles apart, due north and south of one another, the equator crossing Kenya, the more northern of the two. It was the missionary Rebmann of Mombasa who, in 1848, first reported the existence of Kilimanjaro. In the following year his colleague, Krapf, saw Kenya from Kitui, a spot 90 miles south-east of the peak. Since that time Kilimanjaro is said to have been visited by more than a hundred Europeans, and both the British and the German Governments have now established stations in its immediate proximity. Its summit was conquered in 1889 by Dr. Hans Meyer. Kenya, on the other hand, being further inland, and for other reasons less accessible, has been more rarely visited. It was seen, for the second time only, in 1883 by Joseph Thomson, when he crossed the plateau of Laikipia, out of which rise the north-western slopes of the mountain. In 1887 Count Teleki penetrated the forest girdle of Kenya, and succeeded in reaching an elevation of nearly 14,000 feet. Six years later Dr. Gregory attained to a height probably about 2000 feet greater. Both of these attempts were on the south-western quadrant of the mountain. Captain Dundas had previously failed to emerge from the forests of the southern slope, but Dr. Kolb at a later time reached the open "alp" above the eastern forest. It appeared, therefore, that when the Uganda railway had reduced the distance from the coast to Kenya by two-thirds, it should be possible,

* Read at the Royal Geographical Society, January 22, 1900. Maps, p. 564.

with no great expenditure of time, to convey a well-equipped expedition in a state of European health to the foot of the mountain, and that such an expedition would have a reasonable chance of completing the revelation of its alpine secrets.

Rail-head having arrived at the requisite point in the summer of last year, our party, consisting of six Europeans, left Marseilles on June 10. My colleagues were Mr. C. B. Hausburg, who shared with me the expense of the expedition; Mr. E. H. Saunders, a collector; Mr. C. F. Camburn, a taxidermist; César Ollier, an Alpine guide from Courmayeur; and Joseph Brocherel, a porter from the same village. We were aided by a grant from this Society. Mr. Hausburg was good enough to act, not merely as photographer, but also as camp-master, thus leaving me free for observation and survey. The most important item in our equipment was a series of forty boxes, tin-lined, each weighing 25 lbs., and containing a day's complete rations for six white men. Two of these boxes were a man's load, and we carried them to the mountain, where food could not be obtained. They served our purpose admirably, and in a year of unusual drought were the basis of our success. By any other method of packing, theft and waste would have compelled retreat long before our work was accomplished.

We reached Zanzibar on June 28, and, warned by a telegram from Mombasa informing us that other caravans were about to set out for the interior, and that porters were in unusual demand, we asked for and obtained the kind permission of General Matthews, the Sultan's first minister, to recruit Swahilis in Zanzibar. On July 4 we landed at Mombasa, where famine-stricken Wanyika were engaged on relief works, and small-pox was prevalent. We therefore arranged with Major Souttar, to whom our thanks are due, that the fifty-nine Zanzibaris, who arrived on the 6th, should march to the fort and be isolated for the night. On the following morning they were placed in the train and sent to rail-head, then at Nairobi, a three days' journey from Mombasa. Mr. Hausburg took charge of them, and with him there went the other four Europeans, while I remained at Mombasa until the 12th, completing our arrangements. The advanced party were delayed by a railway accident, and Hausburg had to undertake the transhipment of all our goods at midnight. During my stay at Mombasa, I enjoyed the very kind hospitality of the chief engineer of the Uganda railway and Mrs. Whitehouse.

At Nairobi we camped alongside Mr. S. L. Hinde, the collector of Masailand. There we recruited local porters, with the invaluable help of Mr. F. G. Hall, the well-known district officer at Fort Smith. We also learned something of the ways of the country and of its game, and spent pleasant days in the company of the railway and Protectorate officials. With the aid of Captain Bearcroft of H.M.S. *Philomel*, of the Eastern Telegraph Company and Mr. Anderson, their manager at

Zanzibar, and of the Uganda railway and Mr. Stallibrass, the director of telegraphs, I endeavoured to fix telegraphically the longitude of Nairobi as a base for our work. Most unfortunately, the sky was overcast on two successive days selected for the operation; then the spread of small-pox compelled us to clear precipitately from Nairobi under threat of quarantine. On my return from Kenya, the *Philomel* had gone to Delagoa bay to take part in the Boer war.

We parted from Mr. and Mrs. Hinde at Nairobi, but we owe so much to their kind help, that they must be counted as members of the expedition in charge of the base.

The last detachment of the caravan left the railway on July 26, and

ON THE ATHI PLAINS.

marched to our first camp on the Nairobi river, 9 miles from the station. There we concentrated, and after a day's delay commenced our journey to Kenya in the morning mist of the 28th. All told we were 170 strong—six Europeans, sixty-six Swahilis, two tall Masai guides, and the remainder naked Wakikuyu. For four days we crossed the Kapoti plains, steering by Donyo Sabuk, the "great mountain" of the Masai. The plains are treeless and carpeted with sweet grass, which at this season was burned brown and crumbled under the foot. In addition to the Nairobi, we crossed three considerable streams—the Ruiru, the Daruku, and the Thika—whose waters, thigh-deep, are drawn from the slopes of Kikuyu away to the north-west. Their winding valleys are trenched into the plateau, and along the bottoms a continuous belt of

tree and bush overarches the river-channel. There was evidence of lions at the river-banks, but game was not very abundant in this part of the plain, although we had seen herds of 1500 zebra, wildebeeste, and hartebeeste at a distance of 20 or 30 miles to southward beyond the Nairobi station. Rhinoceros were the most striking tenants of the waste. On two occasions, when we went more than usually near to them, they charged into the caravan, fortunately without serious effect.

At one point the Nairobi river, flowing flush with the plain and encumbered with tall mop-headed papyrus, suddenly plunges into a gorge with twin falls divided by an islet. The gorge head, moist with spray, is choked with tropical vegetation, including palms, which we had not seen since we left Voi, only 100 miles from the coast.

On the banks of the Athi, here called the Begazi, and at the foot of Donyo Sabuk, we fell in with Mbuthia, a wizened Kikuyu chief, with avarice and cunning written in every line of his face, who was returning to his village from a visit to Mr. Ainsworth at Machakos. He brought two cows, the one a gift to him from Mr. Ainsworth, the other for me to present on the Sub-Commissioner's behalf to the principal mzee or elder of Meranga. As long as he was with us it was Mbuthia's proud function, like a Hebrew king, to make pretence of driving these cows. If they strayed, his attendants turned them again to walk in front of him.

On July 31 we made a march of 15 miles from the Athi to Muluka, Mbuthia's village. Our way lay over the plain and across the Thika river into a country set thinly with scraggy trees, like a great apple orchard with drought-burned grass. This is the march-land between the grassy plain of the Masai and the cultivated hills and valleys of the Wakikuyu. Gradually the grass became longer and greener, until at last it was shoulder-high and seed-topped. Then we came suddenly to the brink of the deep valley of the Thuge brook, along which, in the bottom, wound a strip of irrigated cornland. On the opposite side, in a glade of the bush which ran up the slope, we pitched our camp in close neighbourhood to Muluka.

Here our troubles began, for our Kikuyu headmen came to us with strong expressions of distrust as to the intentions of their countryman, Mbuthia. It took some diplomacy to secure peace, and that evening we for the first time put a boma or fence round the camp, and the white men took turn in keeping guard. Next day we made a state entry into Muluka, photographed Mbuthia and his wives, and shifted camp across the ridge on which the village is placed, into the next valley—that of the Ilula brook. It was in this district that Mr. Haslam, one of the Protectorate officers, had been murdered a short time before, and here a neighbour of Mbuthia's, Mudiu of Katumba, a man of singularly deceitful and repellent countenance, intrigued with the Wakikuyu of our caravan, trying to make them desert us, in the hope, no doubt, of looting what

we could not carry without their aid. In the evening, by firelight, our Kikuyu headmen endeavoured to counteract his and similar influences by orations, whose resounding periods and eloquent vowel sounds were seductive even to those of us who could not understand a word that was spoken. As the peroration was reached the orator put questions to the crowd, who replied unanimously, with an effect which resembled the rapid recital of the Church Litany, punctuated by the loud grunting

IN THE KENYA FOREST.

responses of the congregation. These Kikuyu headmen behaved well on the whole, and were loyal to us in spite of considerable temptations. Next morning, however, the whole body of Kikuyu porters attempted to desert, and were only checked by a display of firearms.

From this until August 6 we struck northward and eastward through a difficult country with successive ridges at right angles to our path, and deep-cut valleys between them. Rich banana shambas crowned the summits; irrigated strips of maize wound along the valleys. From a single prominent point in one of these valleys I

counted fourteen separate villages. The soil was of a brilliant red; the grass was green, and the wild-flowers of an English aspect; the well-trodden paths were often sunk like Devonshire lanes, and when the morning dew was on the weeds, and the bananas for a moment out of sight, the whole scene appeared familiar and far from equatorial.

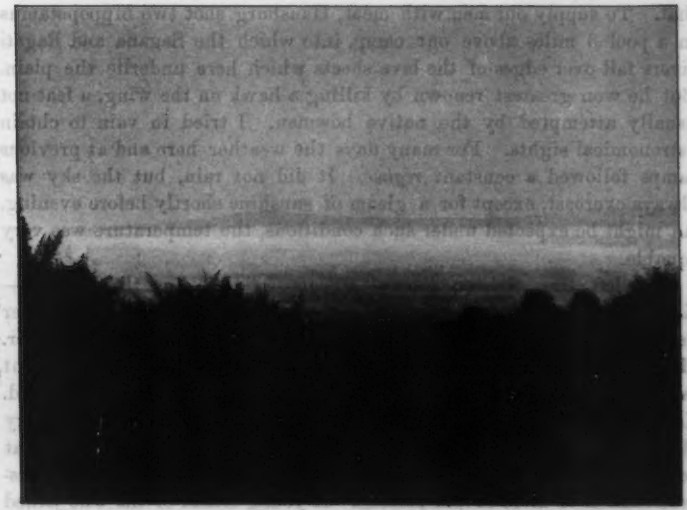
There seems to be no superior government among the Wakikuyu, and our fortunes varied with the character and temper of each local chief or elder. At one camp, on the Iseragua brook, the whole country-side was afraid of us, and through fear was hostile. At night large fires lit up the hilltops around us, the centres, no doubt, of shauri and medicine-making. A woman, probably a spy, tried to gain entry to the boma, and our old Masai, Ndani, got hold of her by the wrist across the fence and was about to run her through with his sword, but Hausburg saved her, and she got away. In the morning we found that the guides had deserted, and that no natives were visible except a group of spearmen high up on one of the remoter paths. We sent out an armed party with our Kikuyu headmen, who, after long parley at a distance gradually reduced, finally brought in two chiefs trembling like aspens. With these we set out, and by much shouting they induced others to join us. None the less, an arrow fell at my feet when we were traversing a thicket that day.

In sharp contrast to this was our treatment by Wanganga, an elder whose village was perched on the highest and steepest ridge which we had to traverse. After having rather nervously climbed some 500 feet under the eyes of spearmen perched on the rocks above us, we were surprised by a warm handshake from a tall dignified savage, supported by his son and by colleagues, and surrounded by the ladies of his harem, who presented to us a "chit," or letter, which he had obtained from Mr. Lane when on a visit to Kitui, and with it the finest sheep which we received as a present during the whole of our journey. We were still more surprised to find that some men, whom our Swahilis and Masai would have disarmed and plundered as suspects but for a fortunate interference on our part, had been guides sent out by Wanganga to bring us safely across his country. I was much impressed about this time by the significance of an inquiry from a chief as to whether I was a good or a bad white man.

On August 6 we marched out of the hill country of Kikuyu—which is a trenched and denuded lava plateau—over the brow of the gneissic hill Kandundu, with an extensive view upon plains to eastward, and then through the gap between the gneissic hills, Kamuti and Kambijo, across the Sagana, to the plain which is the beginning of Meranga. Here we pitched camp and stayed for three days. In the last two marches we had again had to deal with rivers rather than brooks, and of these the Maragua, the Kaiahue, and the Mathioya are worthy of mention.

Meranga is a country about 30 miles across, extending from the

Sagana northward to the edge of the Kenya forests. It has very definite limits. We entered it when we crossed the Sagana; we left it when we crossed the Ragati. It is part of Kikuyu, and yet very distinct from the remainder of that land. It appears to be ruled by a system of informal meetings, or shauris, of elders, who sit on little stools in a great ring. Such a shauri was held within sight of our camp on the day of our arrival, summoned, no doubt, by Magonie, the elder of the neighbouring village, with whom we had made friends. Through our glasses we watched one orator after another address the assembly, and daylight was failing before the interpreter came to announce that "the



THE CLOUDS ON LAIKIPIA PLATEAU, WITH NANDARUA AND SATTIMA ON THE WESTERN HORIZON, AS SEEN FROM THE UPPER LIMIT OF FOREST (ABOUT 10,300 FEET) ON THE SHOULDER OF MOUNT KENYA.

rich men of Meranga," as he put it, had come to visit us. The shauri had, in fact, adjourned to our camp, and when the ring had been re-established, and when Hausburg and I had joined it, and Magonie had made speeches, we were informed that the Wameranga were our friends, and would do all they could for us. Then the fifty Wazee rose, and, shaking hands with us, filed away each to his own village, or, in the case of the more remote, to stay the night with Magonie. Even at this first interview, however, we heard that the Wameranga were at enmity with the Kikuyu peoples, through whose territories, beyond Meranga, we should have to approach the western foot of Kenya, and that consequently there were limits to their power of helping us. Accidentally

I learned, what I afterwards abundantly verified, that Meranga has an alternative name, Ilyaini. There is some legend about a great chief, who was the father or founder of the country, and had two names, Meranga and Ilyaini.

Along the north bank of the Sagana is a most elaborate system of pits intended to trap hippopotamus, which are still plentiful in the river, and invade the native shambas by night, doing much damage. These pits are large and extend so far that together they constitute a considerable work of engineering. We found frequent hippopotamus skulls in their neighbourhood, each the record of a feast, for all the bones except the skull had been removed, and the teeth had gone from that. To supply our men with meat, Hausburg shot two hippopotamus in a pool 3 miles above our camp, into which the Sagana and Ragati rivers fall over edges of the lava sheets which here underlie the plain. But he won greatest renown by killing a hawk on the wing, a feat not usually attempted by the native bowmen. I tried in vain to obtain astronomical sights. For many days the weather here and at previous camps followed a constant *régime*. It did not rain, but the sky was always overcast, except for a gleam of sunshine shortly before evening. As might be expected under such conditions, the temperature was very equable.

We left Magonie's on August 10, our guides being three wazee—Kamanga, Kerrerri, and Magonie. Kamanga was an important elder verging on old age, a pleasant man, but of no strength of character. Magonie was a pushing, boisterous individual, friendly enough, but rather oppressive. We were told that he was a notorious drunkard. Kerrerri was a young man of somewhat Japanese countenance, very pleasant and intelligent, but of slippery character. I learned a great deal from him, but found it necessary to verify everything by the cross-examination of more stupid persons. A young friend of his who joined us later was the handsomest man I saw in Africa, and it struck me frequently that the better-bred Wakikuyu, with their comparatively thin lips, copper skin, well-bridged noses, and slightly oblique eyes, were a far more intelligent people than the average negro, more intelligent also than the negroid rank and file of their own people. In some respects resembling the Masai, they differ markedly from them in character, for the Wakikuyu are mercurial, and the Masai are reserved and silent. Yet the Wakikuyu have nothing of the childish and fatalistic temperament of the Swahili. They are responsible free men, not emancipated slaves.

For 7 miles from Magonie's our way was over the plain through fields of maize and maize stubble, and past banana groves. For the first time since we left the mango trees of the coast, we saw really fine spreading trees of the general appearance of walnut-trees, with large dark foliage—the remainder, no doubt, of the forest which seems to

ZANZIBAR.

"ALPINE VEGETATION ON MOUNT KENYA."

have clothed the greater part of the Kikuyu country at no distant date. The hedges between the fields were mostly of wild tomato, and bore both fruit and flowers. Beans, sweet potatoes, yams, and gourds were abundant. Narrow paths of greasy red soil traversed the country in all directions, crossing the streams by bridges formed of felled trees, the trunks of which are cleft down the centre, the flat surface being upturned. The paths were usually fenced in, and wild flowers grew along their edges. We saw evidence of the use of manure.

Towards the end of this march we entered a hill country, but the cultivation became if anything more extensive and more continuous, and

GIANT LOBELIAS.

the crops more luxuriant, for we had now come to that part of Kikuyu in which it appears to rain almost daily. From August 7 to the 15th, it rained every day from midnight, or earlier, until noon or later. We travelled under the most depressing conditions, drenched to the skin from the moment that we rose, making short marches over slippery paths, and pitching our camp on wet ground. Yet the aspect of the country was something never to be forgotten. Here, in the heart of Africa, in a region previously approached by half a dozen white men at most, we traversed square miles of standing maize, neatly divided by slight furrows into rectangular half-acre plots, each, we were told, valued for sale at the price of a goat, and we had to pitch camp in a market-place strewn with corn-cobs, or to march for several miles to the next vacant

space. As we approached the end of Meranga, however, a singular change took place in the aspect of the people. At Magonie's, on the Sagana, they had worn cloth, and, friendship once established, had come freely into our camp, maintaining a day-long market outside it. Here, as we approached the borders of Wangombe and of the dreaded Watumutumu, even the chiefs wore skins, and for hours we marched over a land heavy with crops, and yet saw neither man nor woman. Again and again Kerrerri asked me to prevent our Swahilis from shouting and singing, in order that the inhabitants might not be frightened, and that he might have an opportunity of establishing relations with them.

Through Meranga we followed the valley of the Ragati, an important tributary of the Sagana not marked on the maps, which descends due southwards from Kenya. On August 12 and 13 we crossed its upper basin, where a number of streams from the Kenya forests converge to form the Ragati proper. Here the higher grounds rise above the cultivation and have the aspect of a rough English common, of the kind that would here be overgrown with gorse and bracken. Both the uplands and the stream-edges were brilliant with flowers; indeed, the whole of the upper part of Meranga is a paradise of wild-flowers.

On August 13 we crossed the Ragati and entered the little country of Kaleti, ruled by the chief Wangombe, a terror to the whole neighbourhood. We were told that at the time of our visit he held prisoner the son of our Masai, Ndani, and the brother of our Meranga, Kerrerri. In the early morning of the 14th, before we had as yet met the chief, Magonie and Kerrerri fled from us rather than encounter him. We had no alternative but to advance into his country without a guide. We made straight for his village, with the effect that he came out to meet us. After a long and irritating interview, he at last abandoned his effort to induce us to camp alongside of him, and undertook to guide us to the Sagana and to supply us with food, but he would have nothing to do with our friends the Wameranga.

We now marched for two days through a forest containing many elephants, whose paths we followed. The flowers were here rarer, but of the same species as in the cultivated country. The most singular point, however, was the almost complete absence of winged insects, at any rate in the day-time. Song birds, on the other hand, were abundant. The lofty trees were hung with beard-moss. Here and there we traversed green glades, from which conical hills, clothed with forest, could be seen to rise from among the trees in our neighbourhood. Niana and Kehari, the most prominent of these hills, became important landmarks at a later stage of our journey.

The rain now ceased, though it obviously persisted in the country that we had traversed. Ahead, to northward, was a great arch of blue sky, a clearing which had been seen at times, low on the horizon, from so distant a point as Magonie's. The relation of rain, wind, and

land-relief was, in fact, strikingly illustrated by our experiences. The south-east monsoon was blowing strongly without depositing rain on the plains of the Athi and Sagana, whose elevation is about 5000 feet. When it struck the slope of Kikuyu, which rises gradually from 5000 feet to about 7000 feet, it drenched the whole country side. The high plains of Laikipia, which surmount the slope at an elevation of about 7000 feet, were dry. So sudden is the change from Kikuyu to Laikipia, that in the course of a single march of about 9 miles we left a

TREE GROUNDSEL.

dripping forest and came to a land which was the scene during the next few weeks, not merely of prairie fires, but also of forest fires. Yet in the presence of these fires we could see the heavy bank of clouds close at hand, driving up over the brink of the plateau and melting into thin air.

It was on the afternoon of August 15 that we emerged from the forest of Kikuyu, and crossing the Sagana again, here flowing to south-westward as a brawling mountain stream, we pitched the camp which

was to be the base of our operations on Kenya. The site was a high one, and gave a wide view over the brown steppe of Laikipia to the distant curves of the Aberdare range. That evening the setting sun lit up the peak and snows of Kenya, which rose abruptly above the forest curtain of the mountain, at whose edge, splayed out for some distance on to the plain, we had now arrived.

Our first attention was to commissariat. Wangombe had promised us food for our porters, and he now refused to deliver it. We had no alternative but to detain him until he made his word good. We had a store of grain, accumulated during our passage through Meranga, but that was essential for the porters who were to be sent on to the mountain. In two days, as a consequence of our action, a caravan arrived, both of men and women, bringing a considerable supply, for which we paid liberally in cloth. We then paid off a portion of our Wakikuyu and sent them home. At the same time Wagombe left us, promising further supplies.

Next day, August 18, two parties left the camp—the one, under Sulimani, our Swahili headman, returned to Wangombe's to buy more food; the other was the mountain party in my own charge. Hausburg stayed in camp until the return of Sulimani, and was then to join me. Of the porters going to the mountain, twelve were equipped to remain there for some time, old Metropolitan police coats, boots, and extra blankets being served out to them.

On the evening of the 18th my party made a short march to a point at the forest edge, close to that by which Gregory entered it. Next day we commenced what we expected to be a tedious passage of perhaps three days. César and Joseph, woodmen as well as icemen, led the way with axes, and two askaris followed with machetes. Thus we cut what the guides christened "la grande route du Mont Kenya." Our work was eased by availing ourselves of elephant-paths and by keeping steadily to the ridge, thus avóiding the tangle by the streams. There was hoar-frost on the ground as we passed through the portal of the first trees in the early morning. Within, tall straight branchless conifers supported a dark roof of foliage with frequent gaps to the sky. The undergrowth was at first of laurel-like shrub and of tall stinging-nettles, and here green parrots flew screeching in flocks just above the treetops. Presently tufts of bamboo appeared, and then bamboo ousted all growth but the conifers, the ground-weeds, and the rope and string-like creepers. Hour after hour we forged onward, and after a time upward also, until with unexpected progress we grew ambitious of making the passage of the forest-zone in a single day. And this we accomplished, with one hour to spare before the inexorable tropical nightfall. We camped in a glade, part of the glade-maze which runs along the upper edge of the forest, and above us, comparatively close, was the green treeless shoulder of the mountain, hiding the central peak.

The next day we reconnoitred upward with a view to finding a site for the standing camp, which was to be the halfway shelter between the base of the mountain and the foot of the central peak, and in the afternoon we moved the tents to the spot selected. It was at an elevation of about 10,300 feet, and commanded a view over the forest slopes, across the Laikipian steppes, to Sattima and Nandarua, the twin heights of the Aberdare range. The phenomena of wind and cloud were of unceasing interest as watched from this position. At the camp itself even the lightest wind was rare, yet the drift of the smoke from the fires below showed the constant strength of the monsoon on the

KENYA PEAK AND THE TELEKI VALLEY, FROM THE SOUTH-WEST.

plain which we had left. A vast stratum of cloud hung day and night over the rainy slope by which we had ascended to the plain, and this we came to call the "cloud roof of Kikuyu." On one occasion I looked over its upper surface, across 80 miles of white woolly cloud, to the peaks of Donyo Lamuyu emerging like an island from a sea. Especially in the early morning, a tongue of cloud extended from the Kikuyu roof along the eastern foot of Sattima, thus masking from us the western half of Laikipia. At sunrise the summits of Nandarua and Sattima stood out cold and hard against the western sky, but as the morning advanced clouds capped the heights—clouds, however, of quite independent origin from the Kikuyu roof below, or its Laikipian tongue.

On August 21, César, Joseph, and I went up to what proved to be Gregory's Höhnel valley, and here for the first time we saw the

extraordinary vegetation of the alpine zone of the mountain. The unbroken side of the valley, crowned with owl-haunted crags, has a moist peaty soil, in which are set yard-broad hemispherical tufts of wiry grass, each tuft having a moist rotten centre. Well beaten rat-paths ramify in all directions between the tufts, while every here and there are groups of cactus-like giant lobelia, of which some send up tall spikes bearing the flowers. In general appearance very like the lobelia, except as regards the flower, is a species of giant groundsel with silvery leaves; but the greatest curiosity of all is the tree groundsel, with a thick dark trunk 8 or 10 feet high, surmounted by a cactus-like head of green leaves, beneath which is pendant a mass of dead leaves, dry as tinder towards their tips, but moist and rotten near the trunk. Occasionally a tall spike, several feet in height, bearing yellow groundsel flowers and fluffy seeds, stands erect above the leaf-head, or broken and leaning gauntly to one side. In other spots are yellow composites, something like dandelions, but with blossoms sessile on the ground, and bushy everlasting flowers. Beautiful sunbirds with lark-like song fly from lobelia to lobelia.

That evening, as we were on the point of returning to the camp, a lighted match was dropped, for it never occurred to us that where the ground was boggy to the tread any special precaution was needful against fire. But the fire spread behind us with alarming rapidity, feeding on the surface of the grass tufts and the dry ends of the dead groundsel leaves. Next morning, when we set out with eight porters to carry stores up to form a depôt, a great column of smoke rose in front of us, and above it was white cloud drifting away to north-west, as though the volcano were once more in activity. Fortunately the men had boots with them, and, beating an entry through the hissing line of red flames, which broke into a roar as they grasped a tree groundsel or shrub heath, we raced for 50 yards through the acrid smoke. It was fully a quarter of a mile before we could see and breathe freely again, and then we were in a new land. The mountain-side was black, covered with velvety mounds which had once been grass tufts, but set with thousands of gleaming points—the silvery groundsels, which had been protected by the moisture cupped in their broad leaves. Presently we realized that we were within a vast circle of fire, and that the whole of the collecting-ground convenient to our middle camp was endangered. We determined to preserve the upper Höhnel valley, and fought the fire for two hours, at last with success, though a long watch was still necessary to check the flames which every now and again broke from the border of the smouldering area. The sun went down that evening amid smoke-banks of mauve and orange, the orb itself changing from blood-red to a glorious ruddy gold, while above were roseate and pale green clouds. The after-glow was of copper. As night settled down the ruddy glare rose high over the edges of the deep black valley,

and the silver groundsels gleamed weirdly in the diffused light; but in rear—to eastward—was the cold dark valley head, the reward of our struggle in the afternoon.

The next morning we went up to the col above us and looked across the Teleki valley—in and from which Teleki and Gregory reached their highest points—on to the rocks and glaciers of the central peak. We chose, from a distance, the position of our topmost camp, a mile from the foot of the ice, and then returned to our tents by the rushing Höhnel stream, to receive a further relay of stores and to prepare for the final advance on the following day. But that afternoon a message came up from Hausburg, who had just arrived at the middle camp, to

KENYA PEAK AND THE TYNDALL GLACIER.

the effect that two of our Swahilis had been murdered, and that the base camp was nearly devoid of supplies. I immediately left the two guides where they were, and joined Hausburg at sunset.

It appeared that the food caravan sent out on the 18th, in charge of Sulimani, had duly arrived at Wangombe's, and that the porters had bought food for themselves, and also a small quantity to be added to our store. Wangombe then said that he could not get much more in his village, and asked that men should be sent with him to make purchases in another village. This Sulimani refused to arrange, but Sudullah, an energetic and favourite askari, insisted on going, and five others volunteered to go with him. Wangombe and many of his men accompanied them. While passing through a banana shamba, our

party was attacked with arrows and spears by a force in ambush, led, apparently, by Wangombe's brother. A fight ensued, in which two men fell on our side, and, it was reported, five on that of the enemy. The remainder of our men got back to camp, bringing with them the weapons of their slain adversaries, but Sudullah was unfortunately one of the killed. Wangombe came to Sulimani that evening, asking him to stay where he was, as he wished for a shauri in the morning; but Sulimani struck camp at midnight, and returned to Hausburg on the morning of the 21st. On the 22nd Hausburg despatched Sulimani with thirty-five men, including the two Masai guides, to buy food at the Government station on Lake Naivasha, and leaving the base camp, now protected by a good boma, in charge of Ali, the interpreter, himself came up the mountain to consult with me.

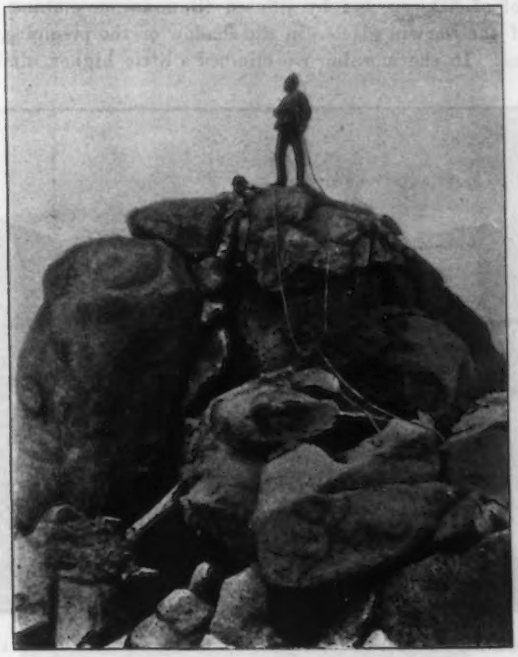
On August 24 Hausburg and I went down again to the base, taking Saunders with us and all the food that could be spared. After going carefully through our stock, we determined to divide everything eatable between the men who still remained at the camp, and to despatch them in Sulimani's track towards Naivasha. They refused to stir without a white man to lead them, and we had reluctantly to give the charge to our collector, Mr. Saunders. The Masai guides had gone with the previous party, and Saunders had to undertake the crossing of an untraversed country with no better guide than a pocket-compass and an envelope bearing approximate directions. On the evening of the 25th, having accompanied the caravan a short distance on the way, Hausburg and I turned aside to shelter for the night under the lee of a valley brink, with feelings of no little anxiety for the fate both of Sulimani and Saunders. The garrison on the mountain had food for about three weeks.

The next day we returned through the forest to the middle camp, and, while Hausburg helped Camburn to collect there and in the Höhnel valley, I rejoined César and Joseph in the Teleki valley, where they had established our top camp and built a stone hut. Thence, in the early morning of the 30th, we set out on our first attempt to climb the peak.

The central peak of Kenya is a pyramid of highly crystalline rock, cleft at the summit into two points, standing north-west and south-east of one another, the north-western being some 30 or 40 feet higher than the other, and the two perhaps 1000 feet higher than any other point on the mountain. The Masai have a legend that they had their origin on Kenya, and I propose that the twin points should be named after the great Masai chief, Batian, and Nelion, his brother. I owe the suggestion to Mr. S. L. Hinde. Nearly three-quarters of a mile to south-eastward an ice-clad peak, visible from the plains of Laikipia, rises to about 16,300 feet, and for this I suggest the name of the living Masai chief, Lenana. Between Lenana and the central peak are glacier passes from

which descend to northward and southward respectively, the two chief glaciers of Kenya, which have been named after Gregory and Lewis. As the word *Kenya* is probably a corruption of the Masai word signifying "mist," it seems appropriate, on that as well as physical grounds, to describe the notch in the summit between Batian and Nelion as the "Gate of the Mist."

Our way led up the left lateral moraine of the Lewis glacier, then



THE SUMMIT OF KENYA (POINT BATIAN).

diagonally across the glacier to a snow-filled couloir near its north-western corner. A short distance up the couloir we turned to the left and climbed the eastern face of the southern *arête* of the peak. We were here delayed by three *mauvais pas* and the treacherous nature of the fissured rock. On the ridge we were further delayed by the broken character of the edge, which compelled frequent traverses, so that night fell upon us at the foot of the point Nelion. We therefore sought a slab of rock just below the *arête* on its western side, and, after such food as could be afforded, tied ourselves to the rocks and prepared for the twelve hours of equatorial darkness. We were at an elevation of

about 16,800 feet, but the cold was fortunately less than at the camp in the hollow of the head of the Teleki valley. It was not until 2 a.m. that the east wind, which had been moaning and screaming through the chinks of the rock-wall behind us, began to reach over and to stroke us with paws of cold air, making us draw close together and beat our knees. The sky was cloudless, and the stars, shining like lamps without twinkling, shed light enough to reveal the lakelets on the Two Tarn col to west of us. At 3 p.m. the moon rose, casting a cold light over the vast cloud roof of Kikuyu, and by diffused illumination making clear the surface of the Darwin glacier in the shadow of the precipice, 1500 feet beneath us. In the morning we climbed a little higher, aiming at the

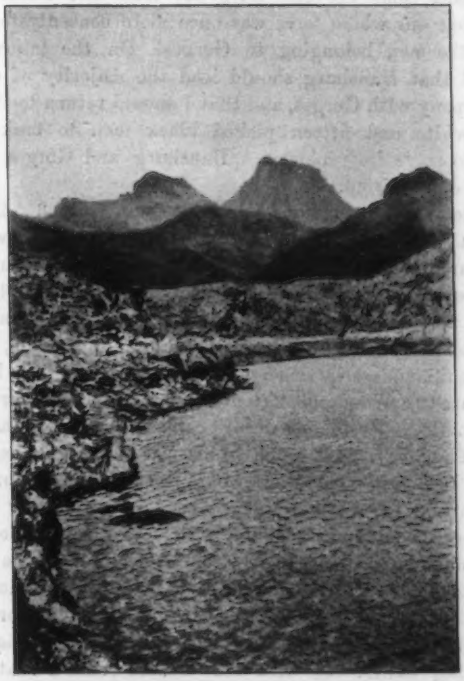
AT AN ELEVATION OF 14,000 FEET, NEAR THE NORTHERN FOOT OF KENYA PEAK.

point Nelion, but were speedily brought up by a cleft cut completely through the peak, dividing the southern *arête* from Nelion. We had no alternative but to abandon the effort and return to our camp.

Hausburg and I now changed places, and while he and the two guides took the photographic camera, in one long day, completely round the foot of the peak, I went down on to the Laikipian plain to watch for the return of our caravans. I had to traverse the smouldering remains of a fire, which had seized the lower edge of the Kenya forest where it was crossed by our path.

As the days went by, spent chiefly in scanning the plain with a glass, and no one approached us, my wait became an anxious one; and

on September 5, being the fifteenth day since the departure of Sulimani and the eleventh since that of Saunders, I had to send word for all to come down from the mountain in order to start for Naivasha on the 7th, lest starvation should overtake us. On the day arranged Hausburg duly conducted the retreat, to the bitter chagrin of César who had again been defeated by the peak. He and Joseph had laboriously cut their way up the Darwin glacier, and, bad weather intervening,



KENYA PEAK AND LENANA, FROM THE EAST. THE HALL TARN IN THE FOREGROUND.

could neither mount higher nor yet return by the dangerous way that they had come. They managed, however, to effect a traverse to the south *arête*, and returned by the route which we had followed in the first attempt.

Most fortunately, however, some two hours before Hausburg's arrival, Sulimani and Saunders marched in, and with them Captain Gorges, who commands at Naivasha. Sulimani had reached Naivasha, and after three days, consumed by an official correspondence, Captain Gorges had obtained leave to return with him to the foot of Kenya.

They took local Masai guides, and followed an important native track over the Aberdare range to the north of Sattima, a track apparently unrecorded except in the native itineraries collected at Mombasa and published by Wakefield in 1870. By an extraordinary chance, Saunders, who had made a difficult and toilsome journey over the shoulders of Sattima through trackless ravines choked with bush, struck the path which Gorges was following just half an hour before the caravan from Naivasha came up, two days out from the station. Thus it happened that our whole force was once more concentrated, and reinforced by the men belonging to Gorges. On the following day it was decided that Hausburg should lead the majority of our caravan back in company with Gorges, and that I should return to the mountain with four white and fifteen picked black men to make one more endeavour to solve its problems. Hausburg and Gorges left within six hours of our decision.

I now determined to move our base camp some 3 miles into the forest, and to leave Saunders and Camburn there, on a new collecting-ground. Our little force could not effect the removal of our stores at a single journey, and, following a practice which we had hitherto found successful, a portion of them was hidden in the bush. Unfortunately, we were watched on this occasion without our knowledge, and on the morrow, when Saunders returned to complete the removal, he surprised natives, apparently Wanderobo (elephant hunters of the forest), in the very act of looting. By the use of bird-calls as a warning, they managed to escape. They carried off much which was of little value to us; but the tin-lined food cases, whose loss would have compelled our immediate flight, had proved too difficult to be opened in a hurry by Wanderobo. This was not the only occasion on which we had evidence of the Wanderobo on Kenya, though they were so timid that we never succeeded in establishing relations with them. On one occasion, however, at an elevation of over 12,000 feet, when white men were absent, a party of eight of them came to three of our porters and inquired their business. They went away with the laconic remark that there was much shooting on the mountain.

At last, on September 12, César, Joseph, and I left our top camp at noon to make the final attempt to reach the summit. The journey round the peak, made by Hausburg, had clearly shown that no way was practicable up the northern precipice, and we had already failed twice on the southern side, once on rock and once on ice. We now planned a route partly over rock and partly over ice. We followed our first track up and across the Lewis glacier, and up the face of the southern *arête*, near the top of which we spent the night under a Mummery tent. We were up at earliest dawn, and away as soon as the sun rose out of the cloud roof to eastward, thawing our hands so that we could grasp the rocks. A traverse, with steps across the head of the Darwin glacier,

brought us to a rocky rib descending from the western corner of Nelion, and up this we crept for a short way. We then decided to cross the glacier which hangs from the Gate of the Mist between the two points, and drains by a couloir into the Darwin glacier below. It proved very steep and intensely hard, so that three hours were consumed in cutting steps on a traverse which we had hoped to make in twenty minutes. A final rock scramble enabled us to set foot on the summit of

LAKE MICHAELSON. THE LAKE WAS ABOUT 1500 FEET BELOW THE POINT OF OBSERVATION.

Batian precisely at noon on September 13. The view from the Gate of the Mist had been magnificent. At the summit we were a few moments too late, for the mist, driving up, gave only momentary glimpses into the valleys beneath.

The mountain-top is like a stunted tower rising from among ruins and crowned by three or four low turrets, upon which we sat, feet inward. There was no snow there, and the thermometer slung in the air gave a temperature of 40° Fahr., while several kinds of lichen grew on the rocks. We dare, however, stay only forty minutes—time enough

to make observations and to photograph—and then had to descend, not from any physical inconvenience due to the elevation, but for fear of the afternoon storm. We made our way downward from step to step cautiously in the mist, and reached our sleeping-place of the previous night at sunset; but we continued down the rocks by the moonlight, and arrived in camp after 10 p.m., exhausted, but victorious. We supped by the fire at midnight, with the sound of the Nairobi torrent ringing on the rocks and swelling and falling in the breeze, and from time to time with the hoot of an owl or bark of a leopard, yet none of them seeming to break the silence of the great peak which rose among the stars, sternly graceful, in the cold light of the sinking moon.

After a day's rest, we set out on a three days' journey round the mountain by a wider circuit than that followed by Hausburg. As no native could accompany us, and as we carried a plane-table in addition to food, we had to forego a tent, and to sleep in the open beside a fire of tree groundsel. We traversed the heads of six valleys, each with a character of its own. The Hobley valley has a great scree at its head of coarse blocks, for the most part brilliantly red, and it has a glaciated platform on its side bearing a tarn, with a second tarn in the bed of the valley. The Gorges valley has apparently been half filled with a subsequent flow of lava, so that it has a broad pavement, upon which are everywhere traces of extensive glaciation, and among them many tarns, mostly dry, and some containing pumice. A gorge, 1500 feet in depth, has at one place been worn into this platform, leading down to a black lake surrounded by cliffs. The Hinde valley is the widest and altogether the most spacious of the six, although it does not originate in the central peak. The Mackinder valley bears the drainage from the Gregory and minor northern glaciers, and is dominated on the north by two grand crags, which I have named, from Masai chiefs, Sendeyo and Tereri. The Hausburg valley is double-headed, being invaded by the glaciated end of the ridge which forms the central peak. It receives water from three glaciers. The Teleki valley has four distinct features at its head—two rocky corries or cirques, the Lewis glacier, and the central peak. To these six valleys should be added a seventh, the Höhnel, although we had no occasion to traverse it during this circuit. It has a considerable lake in its head, and, like the Hinde valley, does not derive immediately from the central peak. All these valleys are thrown eastward and westward from a lightly devious craggy ridge, lying nearly north and south, and bearing Lenana, but not the central peak. The axis of the central peak, on the other hand, lies at right angles to this, striking from Lenana to the head of the Hausburg valley, and throwing down the glaciers northward and southward.

From the end of the high ridge, between the Gorges and Hinde

valleys, we looked on to what we called provisionally the East mountain—a broad green mound at a distance of about 10 miles, far larger and loftier than the numerous small cones which rise from the forest of the eastern and southern slopes. Between the East mountain and Kenya proper is green rolling country, scored by valleys, the whole of it above the level of trees.

We returned to the camp in the forest on September 20, where we rejoined Saunders and Camburn, and on the following day commenced our homeward journey. We crossed Laikipia north-westward, fording streams both of the Nairobi and Guaso Nyiro systems, but the most interesting features encountered were two parallel escarpments, striking with curious straightness north-north-west for many miles, and defining a strip of raised country some 8 or 9 miles across. The surface of the strip dipped gently northward, so that the escarpments were highest towards the south, that on the western side being seen to rise to quite 2000 feet above the plain. These are probably fault scarps, and lie nearly parallel to the scarps of the Great Rift valley. Together with Sattima and Nandarua they form Thomson's Aberdare range, and I would suggest that we should add to the presidential character of the range by speaking of the raised strip north of Sattima as the Markham Downs, for the landscape is markedly unlike that of Laikipia, and resembles that of the Sussex hills.

Beyond the second scarp we came down on to the Masai country of Ondagobbus, in which, towards the north, we saw the lake "El Bor Lossat," possibly identical with Thomson's Telphusa swamp. With the aid of the observations made by Saunders when crossing Sattima, I was able to lay out approximately the upper course of the river Morendat, and then, leaving the caravan to follow, I walked ahead to Naivasha, where I arrived on September 29. Thence, by the help of Captain Gorges and other friends, I was rapidly forwarded on my way to the coast, and, catching a steamer without delay, arrived in London on October 30. The remainder of the party, in the kind charge of Mr. Hausburg, came by the French mail, and reached Marseilles on November 13.

The results of our expedition are a plane-table sketch of the upper part of Kenya, together with rock specimens, two route surveys along lines not previously traversed, a series of meteorological and hypsometrical observations, photographs by the ordinary and by the Ives colour processes, collections of mammals, birds, and plants, and a small collection of insects. But we were unfortunate enough to lose a portion of our plants on the homeward journey.

Finally, I wish to express my sense of the indispensable services rendered to the expedition by my colleagues. César and Joseph had a passion for work which made itself especially evident upon the ice and in the forest. Our success upon the peak was in large measure due to

César's judgment. Of the plucky crossing of Sattima by Saunders I have already spoken. To him and to Camburn we owe the excellent condition of the collections brought home. Above all I owe thanks to my friend Mr. C. B. Hausburg, who not only shared the expense of the expedition, but took so large a part in the management of the caravan, and proved himself so invaluable a shot and so accomplished a photographer. And we all owe thanks to those in East Africa who helped and befriended us.

Before the reading of the paper, the Chairman, Sir THOMAS HOLDICH (Vice-President), said: Mr. Mackinder, who will read the paper to-night, is well known to all of us as a scientific geographer; to-night he comes before us as a most successful traveller, as the first man to ascend one of the principal peaks in East Africa, Mount Kenya. I would particularly ask your attention to the illustrations of his paper. This is the first time, I believe, in which the art of colour photography has been applied to the illustration of a scientific expedition; at any rate, it is the first time the results have been shown in this room. I will now ask Mr. Mackinder to read his paper.

After the reading of the paper, the following discussion took place:—

Sir THOMAS HOLDICH: Mr. Mackinder's story of difficulties met and overcome in his plucky ascent of Mount Kenya, together with the delightful series of illustrations he has given us, may, I think, be considered a model of descriptive illustration. His expedition was so well armed at all points to meet the scientific requirements of an expedition of this nature, that it does, to a certain extent, in a way which an expedition less well equipped would hardly do, challenge, not criticism, but discussion. Dr. Gregory, who was some years ago in East Africa, whose name you have heard mentioned by Mr. Mackinder in connection with this particular peak, has written a few words of comment on the altitudes obtained, which I will read to you, and after reading them, I hope that some of the gentlemen here present will speak. Mr. Hinde, the resident in Masailand; Captain Smith, the surveyor of the route from Mombasa; Dr. Bowdler Sharpe, who can tell us something of the natural history of these regions; and Mr. Ravenstein, the well-known geographer, will, I trust, give us some of their views. I will now read Dr. Gregory's letter.

"I much regret that the necessity for my reaching Melbourne well before the end of February, prevents my attending next Monday's meeting to personally congratulate Mr. Mackinder on the success of his expedition to Kenya. I can offer him my sincerest congratulations, as I have heard from him an account of his work and results. As a couple of years ago doubt was thrown on my explanation of the mountain, I am glad to hear from Mr. Mackinder that we are fully in accord as to its structure. The only point where we do not agree is as to the absolute height of the highest peak. Mr. Mackinder, from his result with the Watkin aneroid, supports Captain Smith's determination of 17,200 feet, whereas from a rough triangulation with an Abney level from some bases in the alpine zone determined by boiling-point observations, I accepted Lieut. von Höhnel's result of little over 19,000 feet. Smith and von Höhnel's results were both based on careful triangulation, and the question is whose data was the most reliable. Von Höhnel's observations were made at the west foot of the mountain, whence the peak rose above him with an elevation of about 29° (as I write in train, I can only trust to memory for these figures). This base-line was short, and the errors of observation and refraction under such circumstances were at a minimum. Captain Smith's

conditions were less favourable; his base-line was many times longer, and the angular elevation of the mountain small. The country between him and Kenya was occupied by alternate belts of veldt and forest; accordingly the atmosphere consists of belts alternately more or less humid. Refraction under these circumstances would be at its maximum, and the amount indeterminable with precision. Captain Smith's results, therefore, do not seem to me to command the same confidence as von Höhnel's.

"That refraction alters the apparent elevation of African mountains to the extent of hundreds and even thousands of feet is well known; it may be illustrated by the cases in which distant mountains sometimes rise above and fall below the horizon of a given spot, according to the condition of the atmosphere.

"Moreover, the lower estimate seems to me inherently improbable, as it would introduce anomalies in the distribution of the ground-line. Mawenzi, the lower peak of Kilimanjaro, is about 17,000 feet high—some estimates have placed it a little higher—but Mawenzi, though 280 miles further south than Kenya, has no glaciers at all. Meru, well over 16,000 feet high, owes its name to its summit being occasionally whitened by snow, but it has no glaciers or permanent snow. If Kenya be only 17,200 feet high, how can we explain the existence of fourteen glaciers on it, if mountains much further north, and only a little lower, have none?

"Hence it seems to me that von Höhnel not only had the more favourable position for reliable results, but that his results are in better agreement with the general geography of the country. I am, therefore, still inclined to accept the earlier and higher estimate of the altitude of Kenya.

"But this is a mere detail, which may not be settled until a mercurial barometer has paid a visit to Kenya. And I can only renew my congratulations to Mr. Mackinder on the success of his boldly planned and well-achieved expedition, which I hope will tempt other equally trained observers to devote their summer vacations to monographing some of the now accessible and little-known areas of British East Africa.

"I should like to add a word of congratulation to Mr. Saunders on his plucky first traverse of the mountain block of Settima."

Beyond a remark that Dr. Gregory has certainly vastly over-estimated the value of the corrections which refraction may render necessary to the observation of altitudes, I will add nothing to what has been said, but will leave Mr. Mackinder to answer this criticism himself.

Mr. S. L. Hinde: After having seen something of the start and finish of the expedition, I have had the great pleasure to-night and the very good fortune of hearing the details of Mr. Mackinder's most successful exploration. Unfortunately, I have not had the opportunity of talking them over with him, but I think he has said too little of the difficulties he had to overcome. He came into the country at a time when it was famine-stricken. A famine had been raging for over two years, and, as a consequence, great difficulty was experienced in getting food for the natives, and very great trouble in collecting food for a number of men in any given district. It was considered necessary to go through Meranga. This small but rich country is perhaps the only part of East Africa which had not suffered from famine during these two years, but shortly before Mr. Mackinder's expedition started, we had been involved in trouble with the natives, whom we know to be very treacherous. We lost one officer and a number of men, and for that reason did not perhaps encourage Mr. Mackinder to go to Mount Kenya as much as we might have done. We appealed to this country for help for the famine among our people, but unfortunately found that the eyes of the public

were directed towards another part of Africa. With famine among primitive natives, small-pox almost invariably goes hand-in-hand, and an epidemic was raging from Mombasa to the Uganda border. It was only with the greatest care and most stringent precautions that Mr. Mackinder succeeded in getting his caravan through the country without contamination. He has laid no stress on these points, but his pluck in dealing with difficult situations, and the assistance he received from his colleagues before he actually attempted the mountain, have, I think, had more to do with his success than he implied in his paper. I must congratulate all the members of the expedition on their exceedingly successful geographical work.

Captain G. E. Smith: I am most interested to be present at the excellent descriptive lecture on East Africa this evening, having spent over two years in that part of the world. I was never nearer than 90 miles from the peak of Kenya, but I have seen it from many points, and it was one of the most important points in my triangulation. I now propose to defend Mr. Mackinder's estimate for its height, thereby defending my own estimate of 17,200 feet. Dr. Gregory states that Lieut. Höhnel's height, with which his own agrees, was 19,000 feet; that it was obtained from observations of the summit on the north side, where the side is steep and the angle of elevation is great. Now, that would be a good way of measuring the summit if you knew for certain the height of the point from which you take your observations, but I do not think he had any better method of obtaining his height at that point than with aneroids, or some sort of barometrical determination. On the other hand, my own work depended on the sea-level, which does not vary very much in different parts of the world. It depends on a triangulation as far as the northern slopes of Kilimanjaro, including that peak itself, by Consul C. S. Smith in 1892, which was carried further north in 1896 and 1897 as far as the lake by myself. From seven different points I observed the summit of Kenya, and the values I obtained from these different points agreed very closely. The probable error I got was 20 feet from these seven observations. That does not absolutely say that my height was within 20 feet, but I think it fairly safe to maintain that the height is not more than 100 feet from my determination. With regard to the refraction of the atmosphere, I can only say that Dr. Gregory is mistaken, because, from a whole series of observations beginning at one point and going round many hilltops up to the lake and back again, a distance of 700 miles, you would expect an error. Well, the error was 23 feet. If the refractions were as he says, nothing of this sort could have been arrived at. I think, speaking from memory, that Dr. Gregory very much overestimated the height of Mount Kimawenzi. He stated the height to be 17,000; I think I am right in saying it is 16,000 feet. Then the general formation is different from Kenya; it has a still more pointed peak, and no high valleys where snow and glaciers can collect, which, even if it has the same height, is an explanation of the lack of glaciers.

Dr. Bowdler Sharpe: I have only to say a few words to-night about the natural history collections which Mr. Mackinder has brought to the British Museum, and which have turned out to be of very great interest, considering the short time Mr. Mackinder was able to be on the mountain. The collections are not very large, but are of great value, as proving the relation between Mount Kenya and the rest of the high mountain system of East Africa. As regards zoology, we have not yet got a report on the mammals from Mr. Oldfield Thomas, but there is a new kind of Hyrax, or coney. I have worked the birds out, and find that if Mr. Jackson had not explored Mount Elgon in 1890, nearly every bird that Mr. Mackinder got would have been new; but the fauna of Mount Kenya is

undoubtedly similar to that of Mount Elgon, and in a lesser degree to that of Mount Kilimanjaro; and thus, as I have often explained before, there is a kind of separate mountain-fauna which extends right across Africa to the Cameroons. A very curious little bird was found by Mr. Jackson on Mount Elgon at a height of 11,000 feet, and I remember saying to Mr. Mackinder that he was bound to find the same sort of little chat on Mount Kenya, at a height of 11,000 feet. This he did, and it was the same species as the Mount Elgon bird, an ordinary-looking little brown chat, with a good deal of white in the tail. It is only found at high elevations, and occurs in the mountains of Abyssinia at an equally high altitude. I now discover the Kilimanjaro bird is not the same as that found by Mr. Mackinder on Mount Kenya. Thus the high fauna of Kilimanjaro is proved to differ a little from that of Mount Kenya. The finest bird he obtained was a splendid Eagle-owl, as big as the European species, *Bubo bubo*; this new species he met with high up the mountain, at a height of 14,000 feet. I have named it after Mr. Mackinder, and I feel very proud of having done so after hearing what he has gone through, and listening to the account of his adventurous journey. He also procured three other new birds, and the names which I have bestowed on them will, I hope, be acceptable to the three other English companions of his travels.

Mr. E. G. Ravenstein: We have heard to-night a most interesting account of a very important expedition, an expedition which I feel sure will be found to have yielded excellent results in at least two departments of science. What I wanted to say with regard to the altitude of Mount Kenya has been anticipated by Captain Smith. For the present, at least, I stick by the results obtained by Captain Smith. I know perfectly well what Höhnel has done, and thoroughly appreciate his work. But if I tell you that Höhnel himself admits his uncertainty about the exact position of the mountain, you will perceive that the result of his observation for its altitude must be uncertain. As far as the glaciers are concerned, it is not the highest mountain that carries the most glaciers, nor is it the oldest head that carries most grey hairs. Water runs off ducks' backs, and there is no chance for glaciers where the slopes are steep, and there are no resting-places for snow to accumulate. Naturally Kenya and Kilimanjaro present in many respects the same features: the southern face is exposed to moisture-bearing winds, and is covered with luxuriant vegetation; the northern slope, deprived of these rain-bearers, is arid, but the quantity of rain and snow and the declivity of the slopes all determine the formation and extent of glaciers. Therefore for the present I adhere to Captain Smith's results, and am glad to find that Mr. Mackinder's rough observations agree with them. I should like to draw attention to the fact that in Kikuyu, near Fort Smith, there is a station which has been occupied for some time by Scottish missionaries, who own an excellent mercurial barometer. Whether this instrument is of use in converting the natives I don't know, but it affords an excellent means of converting aneroid observations into altitudes.

Mr. Mackinder: In reply to very kind comments to-night, I have only to say one or two words on Dr. Gregory's letter. I should like to say, first, how much I feel his generous and valued recognition of the work that has been done; but I am afraid he has misrepresented, through lack of knowledge of the facts, the material I had on which to base my opinion of the height of the mountain. I did not take to the summit only a Watkin aneroid; I took a boiling-point thermometer, and a sling thermometer. Further than this, in the alpine zone, where Dr. Gregory determined the altitude of his base by boiling-point, I also determined the altitude by boiling-point, and came to nearly the same result as Dr. Gregory. He obtained the altitude of the peak above by means of an Abney's level, and I did so by means of a theodolite and a plane-table. I think surveyors will agree

that the chance of my being able to obtain the correct result was greater. I may say I calculated the height from four different combinations, and obtained four slightly different results, all of them something over 17,000 feet. I am not prepared yet to state what is the exact height, because of temperature corrections still to be made. At the same time, I would point out that Captain Smith computed from seven triangles, and that I had four different methods of calculation, and in the whole of these eleven computations, there is nothing that carries us near to 19,000 feet.

Sir THOMAS HOLDICH: I think Captain Smith and Mr. Mackinder have sufficiently well disposed of Dr. Gregory's criticism. I have nothing more to say than to call your attention to the immense importance of fixing correctly the heights of mountains in such positions as Kenya and Kilimanjaro. It is not merely the abstract scientific result which is important; but these mountains, standing as they do as bulwarks to an immense amount of country in Central Africa, give a value for the altitude of any country from which they can be seen. So long as a short base can be measured, and triangulation can be made, by any one working within the radius of visibility, he can at once determine his own altitude. I will say nothing more, but ask you to join me in thanking Mr. Mackinder for his excellent paper, and to congratulate him on being the first man to ascend Mount Kenya.

APPENDIX.

Preliminary Notes by Mr. Mackinder on the Scientific Results of the Mount Kenya Expedition.

CARTOGRAPHY.

The general map showing the route followed by the expedition has been constructed from a route survey made with prismatic compass and watch. Observations for latitude by double altitude were obtained with sextant at camp 17 (18′ 16″ S.), but unfortunately not at camp 11, owing to meteorological conditions. This, however, matters less because when the positions of Donyo Sabuk and Naivasha, as plotted from the route survey, are superimposed upon Captain Smith's positions for those points, my position for Kenya peak, as determined by dead reckoning, differs less than half a minute of latitude and less than two minutes of longitude from that obtained by Captain Smith by triangulation from the Uganda road. The colouring is, of course, exact only in the immediate neighbourhood of the route followed.

The detailed map of the upper portion of Kenya has been constructed from a plane-table sketch. A base of 500 feet was measured, and extended by means of theodolite to 5224 feet. The circuit of about 14 miles very nearly closed. The original sketch was on a scale of 3 inches to the mile.

No native name has been placed upon the maps which was not ascertained or verified by me upon the spot.

ALTITUDES.

Altitudes were measured by means of a Watkin aneroid, checked at short intervals by boiling-points. The aneroid worked very satisfactorily, giving consistent readings. All the readings have been reduced on the basis of a height of

17,200 feet for Kenya peak. This appeared more expedient than a direct comparison with assumed conditions at sea-level, since I had my own observations for temperature up to the summit, and the daily *régime* was very regular.

For the altitude of Kenya, I depend on six measurements by triangulation from the Uganda road made by Captain G. E. Smith, and four measurements made by myself on the spot, although by less rigorous methods. Captain Smith's mean result was 17,184 feet, with a probable error of 20 feet. Since doubt was thrown on this result at the meeting of the Society on January 22, I give my own observations in detail. They may be grouped in pairs, thus:

A. 1.—Boiling-point on summit at 12.30 p.m., September 13, 1900—observed, 181·6°; corrected, 182·2°. Temperature by sling thermometer, 40° Fahr. Assumed temperature at sea-level, 80°. Assumed pressure at sea-level, 29·9 inches (= boiling-point, 212°). Inferred average temperature of intermediate air, 57°. Result, 17,204 feet.

Note.—The pressure observed, being between the morning maximum and the afternoon minimum, would be average; the temperature observed would, of course, be above the average.

A. 2.—Boiling-point at camp 22 in Teleki valley (average of three readings at different hours, checked by seven intermediate aneroid readings)—observed, 187·6°; corrected, 188°. Temperature (average of observations at different hours), 32°; but this exceptionally low owing to position. Inferred average temperature of intermediate air, 60°. Deduced altitude of camp 22, 13,806 feet. Difference of altitudes of peak and camp 22, deduced from difference of pressures, with intermediate air at average temperature 35°, 3322 feet. Result, 17,128 feet.

B. 1.—Altitude of camp 22 assumed at 13,806 feet. Angle of elevation of peak measured at camp 22 by theodolite, 23° 59′. Base measured on plane-table, 8216 feet. Computed height of peak above camp 22, 3655 feet. Result, 17,461 feet.

B. 2.—Boiling-point on hill north of camp 22 at 10.30 a.m., September 15—observed, 185·8°; corrected, 186·2°; reduced (because read at time of morning maximum), 186·1°. Temperature, 41·5°. Inferred temperature of intermediate air, 60°. Deduced altitude of station, 14,948 feet. Angle of elevation of peak above station measured by theodolite, 22° 35′. Base measured on plane-table, 5803 feet. Computed difference of altitudes of peak and station, 2410 feet. Result, 17,358 feet.

Note on B. 1 *and* B. 2.—The triangles of error in this portion of the plane-table sketch were imperceptible, but both the measurements were in the same direction, and the paper may very likely have stretched a little.

The altitudes of Naivasha, Sattima, and Nandarua, given upon the map, have been accepted from Captain Smith. The altitude of Nairobi has been obtained from the railway engineers, and has been corrected for the difference of the coast and Kikuyu base-levels. All the remaining altitudes are from my own observations.

Geology.

The rock specimens brought back are being examined by Prof. W. J. Sollas, F.R.S., and have not yet been compared with Dr. Gregory's collection; nor have I yet seen Dr. Gregory's paper read before the Geological Society on January 24, 1900, only an abstract having as yet been published in the *Geological Magazine*. But there is ground for the following preliminary statements:—

1. The rock at the summit of the point Batian is apparently identical with that found at a lower level on the central peak, and described by Gregory as a nepheline-syenite. The specimen from the summit is holocrystalline, and justifies the inference that the core of the volcano rose far above the present peak. If we assume that the core has been destroyed to the extent of 1000 feet, which would probably suffice to produce the observed results, and that the crater walls rose another 1000 feet above the core, then the original height of Kenya may have equalled that of the still complete Kibo summit of Kilimanjaro.

2. Lavas were observed dipping at low angles—5° to 15°—away from the central peak, in north-easterly, north-westerly, south-westerly, and south-easterly directions. This tends to support Gregory's conclusion that Kenya is a *single* dissected volcanic mass; but the east mountain, upon which we looked from the eastern shoulders of Kenya proper, although low when compared with the similarly placed Mawenzi peak of Kilimanjaro, appears almost too massive to be merely parasitic.

3. The major axis of the central peak strikes in a very straight line for nearly 2 miles from the point Lenana west-north-westward, and throws the glaciers down northern and southern slopes. It is remarkable, however, that the chief water-parting of the mountain runs for more than 5 miles in a direction at right angles to this, through Lenana, and past the eastern foot of the central peak, with the effect that the valleys descend eastward and westward, and that the whole of the existing glacial drainage belongs to the western slope. From a series of specimens obtained at widely separated spots on the summit of the craggy ridge which constitutes the divide, it appears that the lie of the water-parting has been determined by a system of great dykes, whose main direction is from north-north-east to south-south-west. These dykes must have almost split the mountain in two, while cracking it in other directions. It is probably pertinent to note in this connection that while there are small cones along the northern, eastern, and southern margins of the *massif*, there are none immediately at the western foot, under the lee, as it were, of the central peak and core. At the heads of the valleys abutting on the main dykes are grand, almost geometrically perfect *cirques*.

4. In Meranga, the valley of the Ragati, below Kangoso, is floored by what appears to be a lava-stream. As this portion of the valley is cut back from an escarpment overlooking the plain in which the Ragati and Sagana join, it would appear that since the denudation of the surface approximately to its present form, there have been volcanic eruptions on a grander scale than is implied by such minor cones as Kairungu, Niana, and Kehari.

5. At the confluence of the Sagana and the Ragati is a fine section of the lava which constitutes the plain, resting upon the gneiss, which here rises into the hill Kamuti. The surface of the gneiss is smooth and burnt. There is no evidence of a soil between the two rocks.

6. The elevated tract of the Markham downs is defined by two parallel escarpments striking with remarkable straightness for many miles in a direction parallel to the great Rift valley. These are doubtless fault scarps, and the elevation of the block between them is no doubt complementary to the drop in the bed of the Rift valley.

Glaciers and Glaciation.

There are fifteen existing glaciers on Mount Kenya. The Lewis glacier is a mile long, the Gregory glacier is rather shorter, and the remainder are small. The lower ends reach to the following levels:—

Teleki valley,	Tyndall glacier	... ...	14,820	feet.
„ „	Lewis „	... ...	14,850	„
„ „	Darwin „	... ...	14,880	„
Mackinder „	Gregory „	... ...	14,900	„
Hausburg „	César „	... ...	14,450	„

The glacier cols, leading over from the Lewis to the Gregory glaciers, are at an altitude of about 16,100 feet, so that the average slope of the former is about 1 in 4, and of the latter about 1 in 3. There were few important crevasses in the Lewis glacier, except at a point a short distance from its lower end; but the Gregory glacier was much fissured, and exhibited fine seracs.

Everywhere and at all hours the surfaces were dry and crisp. Comparatively little water flowed from the snouts, and the stream-banks gave small indications of floods. The ice was intensely hard, and fed by fine hail rather than snow.

Evidence of past glaciation was most conspicuous in the Gorges and Hausburg valleys, the rocks in which were everywhere beautifully ice-worn down to a level of 14,000 feet. The glaciation is on a grand scale 2 miles below the head of the Gorges valley, on the rock floor into which the Michaelson gorge has been cut. A glacier formerly rode over the Two Tarn col in a westerly direction, and has imparted to its western face an arching curve and glassy smoothness as of a great waterfall. At lower levels, down to about 9000 feet, are large boulders, but I found none lower than that recorded by Gregory. Old moraines were observed down to 12,000 feet.

Meteorology.

A considerable series of cloud observations was taken upon Kenya, extending over the whole of our stay on and near the mountain, but it would be unprofitable to deal with these until the general reports of last year's monsoon have been published.

A barograph was working during sixteen days at elevations of 7000 and 8000 feet. The resulting curves show that the pressure was remarkably steady, that the daily oscillation did not exceed the tenth of an inch, and that there were regular maxima and minima at 10 a.m. and 4 p.m. respectively, and minor maxima and minima at 10 p.m. and 4 a.m. respectively.

The air-temperature at the summit at noon on September 13 was 40°; the lowest temperature in the previous night at 16,700 feet was 28°; the lowest temperature in the night of August 31 at 16,800 feet was 29°.

At Camp 22 (13,800 feet) the night temperatures fell to less than 30°, but the morning sun rapidly raised the air to over 50°, the afternoon cloud lowering it again to 40° or less. The minimum thermometer, exposed to radiation into the cloudless night sky, registered as low as 16°, the ground being covered with hoar frost, and bottom ice forming in the Nairobi stream. The lobelias closed their head of leaves at night-time just like daisies. The air was usually dry, the relative humidity falling on more than one occasion to as low as 54 and 52 per cent. There was no considerable rain or snow fall during our stay at high altitudes (August 20 to September 20), but a little fine wind-driven hail on most afternoons, preceded by a sharp drop in temperature about 2 p.m.

The Sagana at camp 11, measured on August 9, was estimated to have a flow of between 1,500,000 and 2,000,000 cubic feet an hour.

Photography.

A large series of photographs—half and quarter plates—were taken by Mr. Hausburg both on the road and on Kenya, and a few films were exposed by me on

the summit and on the east side of Kenya. Mr. Hausburg also took colour photographs by the Ives process, and of these three are here reproduced, though the prints hardly do justice to the originals as exhibited in the chromoscope. We owe many thanks to Mr. J. Thomson for the very considerable trouble which he has taken in connection with these Ives photographs. The third of the colour prints is of a scene in the Nyika, the scrub-desert, which extends for a hundred miles inland in rear of the fertile coastal belt. The soil is of a redder colour than here represented.

Zoology.

Mammals.—The skins and skulls collected have been described in a paper read before the Zoological Society on February 20 by Mr. Oldfield Thomas. Fourteen species from Kenya are enumerated, besides five others, specimens of which were obtained from Nairobi. The most interesting are two new species of Dassy (*Procavia*). Of these the larger (*P. Mackinderi*) belongs to the rock-inhabiting section of the genus. It is abundant above the forest zone up to 14,500 feet, and has for its nearest relative another new species of smaller size (*P. Jacksoni*) just sent home from the Ravine station by Mr. F. J. Jackson. Apart from these two species, no rock-dassies have been found in any part of East Africa, nor are they known further to the south. The second new dassy obtained by our expedition (*P. Crawshayi*) belongs to the forest-inhabiting group (*Dendrohyrax*). It occurs in the Kenya forest, and has a near ally in *P. valida*, of the lower slopes of Kilimanjaro. An additional specimen was received from Mr. Richard Crawshay, while our material was being worked out. The large size of *P. Mackinderi*, as compared with *P. Jacksoni*, is not without interest in connection with the retreat of the glaciers.

A new sub-species of rat (*Otomys irroratus orestes*) was obtained from the upper edge of the Alpine zone of Kenya.

We observed elephant tracks at an elevation of 11,500 feet on the west side of Kenya, and a complete skeleton of buffalo in the Gorges valley at an elevation of 14,200 feet. A leopard was seen at a height of about 14,000 feet south of the Höhnel lake, and leopard and buffalo tracks at 14,500 feet in the Gorges valley.

Birds.—The collection of birds was referred to by Dr. Bowdler Sharpe in the course of the discussion reported at p. 478. The new species from Mount Kenya are *Bubo Mackinderi*, *Campothera Hausburgi*, *Hyphantornis Camburni*, and *Pinachroa Ernesti*. They have been described by Dr. Sharpe in the *Bulletins* of the British Ornithological Club for December and January last.

Insects.—Prof. E. B. Poulton, F.R.S., has kindly examined the insects collected, and sent me the following statement:—

"The insects collected by Mr. Mackinder's Expedition were not numerous, but included some interesting forms. Among the butterflies, the only two individuals of *Limnas chrysippus* were of the *Klugü* form without the black and white tip to the wings. Further south this form disappears, while it is apparently universal in the north-east in Somaliland. A specimen of the very rare *Synchloe Johnstonii* (Crawley) was captured in Nairobi forest, from which also an individual of *Amaoris echeria*, var. *Albimaculata*, was also obtained, indistinguishable from the specimens from Natal. I believe this to be the most north-easterly range yet recorded for this species. Among the *Acræinæ*, a specimen of the beautiful *A. regalis* was captured. All the butterflies were captured in the dry season, and many of them exhibit marked seasonal variation in colour, pattern, and size. Among other groups two

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new species of *Phytophaga* (Coleoptera) have been described by Mr. Jacoby, and an extremely interesting species of Forficulidæ will be described by Mr. Malcolm Burr. Of the few Hymenoptera, some are apparently new; but the hopeless state of the Ethiopian species of this order forbids the hope that they will be worked out in the immediate future."

Botany.

Several species of lichen, some of them brilliantly coloured, were found on the summit of Kenya. These, together with the mosses collected in the Alpine zone and in the forest, are being described under the direction of Mr. George Murray, F.R.S.

Unfortunately, the greater number of the dried specimens of flowering plants were lost on the road home, but seeds of the giant lobelias and groundsels have been saved.

The highest flowering plant was the everlasting, gathered at about 16,500 feet. There were two very distinct species of giant groundsel and two of giant lobelia.

Anthropology.

The most interesting point noted was the occurrence of Wanderobo at high levels on Mount Kenya. As stated in the paper, they visited some of our men at an elevation of over 12,000 feet, but the remains of grass hut sand of fires, together with the occurrence of footprints, proved that they commonly frequent the upper limit of forest at rather more than 10,000 feet.

On Certain Native Place-Names.

Kápoti = the northern portion of the Athi plains, inhabited by the Kapoti Masai. One of my Masai belonged to the Kapoti, and he told me on the spot that the Thuge brook was the northern boundary of Kapoti. The station on the Uganda railway of this name is many miles from any part of the Kapoti plains.

Meránga = the country between the Sagana at Magonie's and the Ragati east of Wangombe's. The *g* is pronounced as in German (Merang-a, not Meran-ga). Meranga has an alternative name, Ilyaini, which Gregory has attributed to a river in the neighbourhood.

Kaléti = Wangombe's country. South-west of this are the Wa-túmu-túmu. Both Wangombe and the Wa-tumu-tumu are feared by the Wameranga.

Ndóro, Laikípia, now vacated by the Masai.

Ondagóbbus, Kinangóp, Masai pastures west of the Aberdare range.

Kandúndu, Kambíjo, Kamúti, a group of gneissic hills.

Kairúngu, Niána, Kehári, minor extinct volcanic cones.

Kargéna, Kámisséru, ? outliers of the Laikipian lava plateau.

Kangóso, Kandége (or *Chandege*), hills marked by tree clumps, on which periodical markets are held.

Nándarúa, the Kikuyu name of the mountain which is miscalled on the maps "Kinangop." The Naivasha Masai informed me that it is partially occupied with Kikuyu shambas, and is known to the Masai in question as El Donyo Giguyu, "the Kikuyu mountain."

Thúge, Thégu, Ithánga. The *Th* in these names is thick, as in "those." The *g* in the last of them is pronounced as in German (Ithang-a, not Ithan-ga).

Kenáu, the name of a ford across the Sagana on the road from Meranga to Machako's, and not, as shown in some maps, a local name of the river.

Ruíru, Darúku, considerable tributaries of the Athi, which we crossed close

to the main river. They must come from the Kikuyu escarpment, since Mr. F. G. Hall records the names in that neighbourhood in a MS. map which he kindly lent me.

Nairóbi (= (Masai) "cold water" (Mrs. Hinde)). There are two rivers of this name, the one coming out of the cool Kikuyu forest where the Uganda railway enters it, the other originating in the southern glaciers of Kenya. The spelling of the railway station "Nyrobi" is indefensible and calls for remonstrance, before it becomes stereotyped, and before "Nyvasha" is perpetrated.

JOURNEYS IN THE CHINESE SHAN STATES.*

By FRED. W. CAREY.

I. I Bang and I Wu Tea-districts.

Though the muleteers raised hopes of an early start by putting in an appearance shortly after daybreak on the morning of December 4, 1898, there was, of course, the usual delay; for, after strapping all our belongings on to the saddle-frames, they disappeared, and we saw no more of them for several hours. To the inexperienced this kind of thing is trying; but good temper and patience are as indispensable to the traveller in Yun-nan as an absence of nerves. These mental qualities, with some silver, a few tinned edibles, and a camp-bed, may be considered necessities; if, in addition, the traveller possesses a knowledge of the customs and language of the country, he is splendidly equipped.

The "Mafus" turned up again about 10 a.m., with their animals and pack-saddles. Two mules and three horses sufficed to carry everything necessary for a three weeks' trip—including a servant, "boy" and cook combined, who, having packed his clothes and bedding on a horse, climbed up on top, and remained a fixure, so to speak, during the whole trip. The steepest ascent or the most perilous descent had no terrors for him. Perched on the top of his belongings, he simply held on tight, and the horse did the rest. A coolie to carry my camera, and a soldier to act as a guard, also accompanied me.

From Semao the road to I Bang leads south-east, and, as usual in Yun-nan, the way lies over mountain ranges or through valleys in a series of ups and downs that becomes monotonous. We stopped for the first night at Huang Tsao-pa, a small village reputed to be the resort of evil-doers and horse-thieves. My passport gave me right to two guards from village to village and at each resting-place; but my servant demanded twenty men from the headman, to guard our valuable baggage. Apparently, there weren't so many men in the whole village, so we compromised and were satisfied with our landlord's son, who kept

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* Read at the Royal Geographical Society, February 19, 1900. Map, p. 564.

watch outside the house all night. There was, of course, not the slightest danger, and only once during the trip did I show my passport—to ensure civility. All foreigners travelling in these regions are treated as officials; and in proportion as my importance was magnified, so did the rank of my "boy" grow, until I began to have some hesitation in asking him to perform his ordinary menial duties.

Next day the weather changed, and we made our way over the interminable mountain ranges in a drizzling, bitterly cold rain. The road was so slippery that I thought it safer to walk; but my "boy" kept his seat, and studied how best to protect his bedding from the piercing drizzle.

On arriving at Pa-pa, a hamlet of ten houses, I found an "official rest-house," in the shape of a miserable straw hut with more ventilation than shelter, and divided into two by a bamboo partition. I and my horse took possession of one room, while the rest of the caravan tried to make themselves comfortable in the other. At the risk of a general conflagration, we lit a huge fire, and spent the rest of the day drying ourselves and hoping for less inclement weather.

Leaving Pa-pa next day, we followed for some distance the sharp crest of a hill, which led us gradually down until we came to the plain of Meng Wang. This is, I believe, the smallest of the "Sip Song Panna"—the district under the control of the Tussu being unimportant in every respect. We stopped for a time at the village temple, and were visited by the young Tussu—a lad about twelve years of age. He speaks Chinese well, and told me that he had a Chinese tutor. His father had died only a month previously. The little fellow was delighted when I allowed him to look through my binoculars, and asked me to stay the night at Meng Wang; but I was obliged to make a somewhat longer stage, and so pushed on to Wu Lu-ho—a collection of three or four houses, simple shelter for the occasional traveller, with Chinese inhabitants.

Next day the roads were wretched, but the weather was beautifully clear and fresh after the rains. We passed some curious graves—the family vaults of the Pen-jen, or original inhabitants of the country. These graves were shaped like Shan houses, and in front of them, swaying about in the wind, was a varied collection of offerings attached to strings. A long descent and a trying ascent brought us to Pu Yuan, a big village inhabited by Chinese and Pen-jen.

The Pen-jen race belong most probably to the "Woni" race, like many of the hill-tribes in this part of Yun-nan. Indeed, I think it would be possible to classify the numerous aboriginal tribes of Yun-nan and Indo-China under, at the most, four generical headings; and the future traveller would be doing work of scientific merit if he could ascertain, by comparing the language, customs, and dresses, etc., of the tribes met with, the parent-race of each. At present the nomenclature employed

by different travellers is most confusing. Each tribe calls the other by a different name, which often merely refers to some peculiarity of dress or custom; and the same people are frequently described under various names. The ordinary observer, for instance, would see no resemblance between two such apparently distinct tribes as the picturesque Akka—or hill people to the west of the Mekong—and the Ma He, the wretched firewood-carriers of Pu Erh and Semao. Yet they are undoubtedly the same people, speaking the same language, and differing only in name and dress.

In dealing with the so-called aboriginal races of Yun-nan and Indo-China, the two main facts to be taken into account are the gradual intrusion of the Lolos from the north, and the retrogressive movement of the Shans, who were formerly masters of a large part of south and west Yun-nan before the Chinese. Rebellions and petty wars, with the consequent breaking up of once powerful races into scattered tribes, and even the mountainous and unproductive nature of the country itself, have also been main factors in producing an apparently inextricable medley of hybrid. But to return to Pu Yuan.

The costume of the Pu Yuan Pen-jen women is very striking, consisting of a cloth hood, an open jacket, and a pair of short white trousers reaching barely to the knee. But the most important, though the least noticeable, part of their costume is their coloured cloth gaiters. These the women are obliged to wear, as without them it is believed they would be able to fly away, leaving their husbands and sweethearts sorrowful. This legend recalls a custom of ancient Carthage—where the unmarried women wore metal leg-gyves, which were severed only during the marriage ceremony. The Akkas—also a Woni tribe—wear similar gaiters, though I do not think the same importance is attached to them. It is probably an emblem of some old custom of which the true significance has been forgotten.

Leaving Pu Yuan, we descended to the Nam Ban, known locally as the Pu Yuan-kiang. Nam Ban is the Shan name, and Loso is, I think, the Chinese translation of the Pen-jen word for "river." There was no proper ferry-boat, but our luggage was piled up on a bamboo raft, on which we also crossed. The animals were urged by the muleteers into the water, and made to swim across under a shower of stones and profanity. Every Chinese muleteer has an unequalled stock of the latter, no one specimen of which is fit for publication.

In the thick forests which border the banks of the Nam Ban there is said to live an old white elephant. He may some day have a companion, if the French carry out their new project of bringing a railway up the Nam Ban valley.

From the river the road was mostly uphill—splendid exercise for the men, but hard on the poor animals. We stayed at Ki Ka, and the following morning reached I Bang.

I Bang consists of one straggling market street, situated on the ridge of a mountain, and surrounded by deep valleys. The population is about 1000, mostly Chinese engaged in the tea trade; but a little cloth is also made and dyed locally. I visited the tea-plantations—simply clearings on the hill-sides—and obtained specimens of the leaf, flowers, and seeds. To make a plantation, old dried seeds are planted and carefully nourished. When the young plants are sufficiently strong they are transplanted in rows at equal distances. Cuttings will not grow.

At I Bang there are three tea-hills, and from six to eight qualities of tea to each hill. Each locality is supposed to impart its own particular

"HEI PA-I," OR BLACK-SKIRTED SHANS.

flavour to the various qualities. I Bang tea is said to be much better than that produced in the I Wu or Meng Hai districts, though the trees are identical and the cultivation practically the same. But reputation is everything in trade.

The very finest tea is known as "Sheng Ya," and consists of the young unopened leaf-tips, greyish-green in colour, and covered with a silky down. This is the only quality which undergoes no preparation beyond drying in the sun. All the other kinds are much alike, and go to make up the "Pu Erh tea" of commerce.

There is a likin station at I Bang, and likin is paid on all tea prepared and pressed into cakes before leaving; but loose tea going to Semao pays likin on arrival there. The output of the I Bang district is

about 1500 piculs annually. Most of the merchants at I Bang and I Wu, as at Semao, are natives of Shih Ping.

The Tussu and natives of the I Bang district are Pen-jen, who have adopted a dress very much like the Shans. Their name for themselves is "Ve-Niu," which is simply a variation of "Oi-ni," or "Woni."

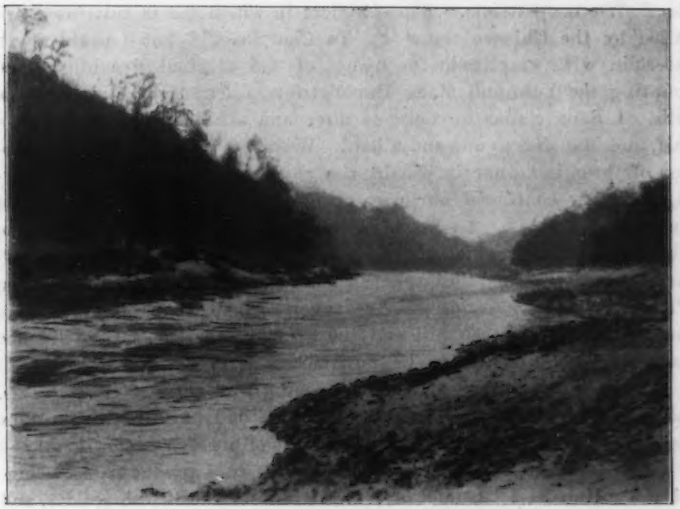
The weather was not favourable for photography, but I brought my camera out at I Bang. The Chinese regarded it with a good deal of suspicion, there being a widespread belief in Yun-nan that foreigners have an instrument (chao pao ching) by means of which they are able to discover hidden treasures, and carry away the luck of a place in the shape of precious stones. But having seen the Likin Weiyuan go through the ordeal of having his portrait taken with equanimity, they were reassured, and the crowd which had been following me in the hope of seeing something extraordinary gradually dispersed. Most of the Chinese along the way had heard of a telescope, and to distract their attention I used to give them my binoculars to play with. The natives were much simpler, and, though many of them had never before seen a foreigner, I found them more hospitable than curious.

Between I Bang and I Wu I slept at a little "Hsiang Tan" (a Lolo tribe) village. The inhabitants were pleased to receive a "great man," who, like themselves, was an "I Chia-jen;"* and when I asked for a vocabulary, they tumbled over each other in their eagerness to supply me with the required information. Like most of the Lolo tribes, the "Hsiang Tan" are fond of music and dancing, and were delighted when I played some simple tunes on my banjo. The young girls of the village started dancing outside the house, and though the only illumination came from my candle-lamp and some pine-wood torches, they kept it up until a late hour. In the first of the 'Etudes Sino-Orientales,' lately published at Shanghai, Père Wial, speaking of the Lolos, says "the men dance, but the women never." This is not at all our experience of the Lolos in this part of Yun-nan. Dancing is looked upon as a healthy amusement to be indulged in by both sexes, and I have never seen the slightest suggestion of immodesty. Indeed, the Lolos are pre-eminently a moral race—very different from their neighbours the Shans.

I Wu is situated on the site of a hill overlooking a valley, and is a slightly larger and more important place than I Bang, with a population of about 2000. The district produces from 3000 to 4000 piculs of tea a year. Some cotton passes through I Wu on its way to Ching Tung, Yun-nanfu, etc., *viâ* Mo Hei; and iron pans, walnuts, and the usual exports also come down by the same route. At Man Nai—two days north of I Wu on the Mo Hei road—there is a likin station, which

* "I Chia," or "I-jen," Chinese for barbarians—a term formerly employed by the Chinese to designate all foreigners, but now forbidden by treaty to be used in official documents.

collects likin on all native produce passing through. At I Wu I met some men and women of the "Yao" tribe. They were up from the "Meng La" district on a hunting excursion, and were awaiting the return of some of their party who were away chasing a wounded elephant. The men were finely built, manly fellows, in appearance not unlike the Cantonese, whilst the women were good looking, and as fearless and independent as the men, with whom socially they are on an equal footing. I wrote down a short vocabulary of their language, and became quite friendly with them. They are not on terms of good-fellowship with the Chinese, and will not answer to the ordinary form of Chinese salutation. Those Chinese who have any



THE MEKONG AT HSIN TU-KON FERRY.

dealings with them address the men as "Las Ken"—a term which they seem to appreciate.

The "Yao" are a hardy race living amongst the mountains, and may be found almost anywhere between the West river in Kwang-si and the Mekong in Yun-nan. They are nomadic in their habits, staying only two or three years in one place. They cultivate valuable medicinal plants for sale to the Chinese, and hunt the elephant for his ivory and the tiger for his bones, which occupy—with deer-horns and other peculiar products of the chase—an important position in the Chinese pharmacopœia. They make their own weapons, and I examined one of their elephant-guns—a kind of cannon in miniature, with a short

wooden stock, carrying a large iron bullet and an immense quantity of coarse powder. When they get within gunshot of their prey, they rest this fearful weapon on, not against, their shoulder, and the recoil carries it some distance behind them. To prevent losing the gun in the thick undergrowth of the forests, one end of a long cord is attached to the stock, the other end being fastened round their bodies. They will follow a wounded animal for days over mountainous country until they run it down.

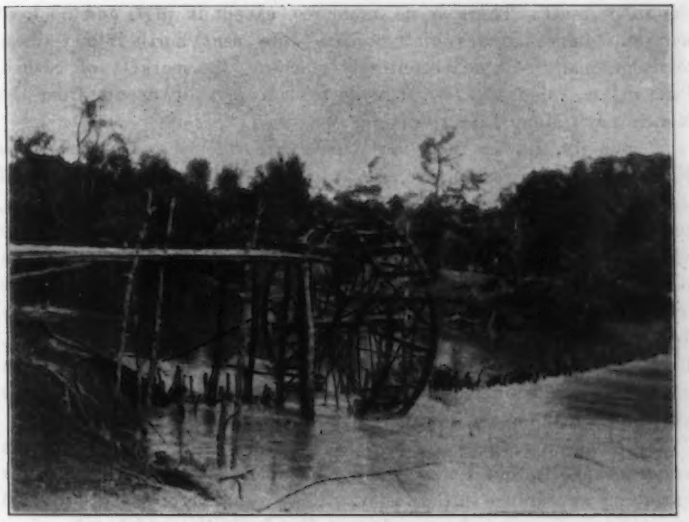
Leaving I Wu, we struck due north along the Man Nai road. The local official insisted on sending me off with a good deal of ceremony, and four soldiers, carrying large red flags and spears, accompanied me as far as Man Sa, where we stopped for luncheon. Man Sa belongs to the I Wu tea-districts. The districts in which tea is cultivated are called by the Chinese the "Wu Ta Cha Shan,"* but I could never ascertain with exactitude the names of the original five hills. Not counting the Yulo and Meng Hai districts, I found there were seven hills. I Bang claims to count as three and a half, I Wu as one and a half, and Man Nai as one and a half. We slept that night at a collection of three huts, hardly worthy the name of village, and the following morning continued our way northwards. For our mid-day meal we stopped at a Han Pa-I village. The Han Pa-I are a clan of Shans who have partly adopted the Chinese dress and customs. They call themselves "Tai ne," the other Shans in the "Sip Song Panna" being "Tai Lu." After leaving this village it commenced to rain, and as the road led up a steep hill and the ground was slippery, we did not reach the next village, Man La, until nearly seven o'clock.

Man La is a good-sized place possessing a number of tiled houses, indicative of prosperity. It constitutes the odd half-hill of the Man Nai district, and the tea that it produces is of a much better quality—so I was assured by our Chinese host—than that produced elsewhere. At the "Han Pa-I" hamlet of Wei Wa we obtained fresh guides, and followed the bed of a stream down to Pei pia. Both these places are in the "Wu Tei" panna.

Tired of my diet of biscuits and rice, I determined to reach Meng Wu the following day if possible. I found on inquiry that there was a small mountain path leading direct to Meng Wu, which the animals would, however, be unable to follow. I therefore engaged three men to accompany me with my camp-bed, a change of clothing, etc., and directed my servant to go with the pack-animals *viâ* Wu Tei, the road following the bed of a stream to that place. At daybreak next morning we started, the road commencing to ascend immediately we had crossed the stream. We reached a height of 3000 feet above Pei pia, and then, after passing a "Ka" village, began to descend. "Ka" means

* "Five great tea-hills."

hill-people, and many of the tribes called "Ka" by the Shans, or "Moi" by the Annamese, belong to the "Woni" race. Our way led down to a small plain watered by a tributary of the Pei pia stream. By the banks was the Shan village of Man Pu, and from there the road led up a terribly steep ascent, which the pack-animals could never have climbed. About one o'clock we came to Man Chu, another "Ka" village. There we broke our fast, squatting around the same low table; and the way in which I appeased my hunger must have convinced the natives that I was accustomed to a diet of glutinous rice and boiled roots. From the inhabitants I bought some curious



A SHAN WATER-WHEEL USED TO IRRIGATE THE FIELDS.

net-worked wallets made of a kind of grass, and obtained a vocabulary which showed their language to be similar to that of the I Bang Pen-jen. The descent into the Meng Wu plain was very long and tiring, but at 5 p.m. I arrived at the village, and was welcomed by the French officials. My luggage did not arrive until the following morning.

Meng Wu is one of the Shan states occupied by the French in 1895. The chief village consists of 160 houses, and the inhabitants are "Pa I," or Shans. It is situated in a large rice-plain watered by the Nam Wu, a tributary of the Mekong. The only sign of the French occupation is a semi-fortified enclosure to the north-east of the village, in which are the bamboo dwellings of the two Europeans and their militia guard.

The latter, constituting the whole available military force of the district, is composed of Shans, and numbers about three dozen. They are called "soldiers" by courtesy, though their principal occupation during my visit was the making of mud bricks and mortar for the new residences which the Europeans are constructing. There is nothing remarkable about Meng Wu except the climate, which is exceptionally trying. Malaria is encouraged, if not engendered, by the dense forests with which the hills around are covered, and from early evening till late in the morning the plain is enveloped in a thick misty fog, which is only dispelled by a scorching sun. In the summer the place is subject to terrific storms, which often unroof the frail bamboo houses and flood out the inhabitants. There is no commerce, except in pigs, and no local market. Large droves of "porkers" are sent north into Chinese territory, many of them eventually reaching the markets of Semao, Pu Erh, or Talang. Likin is collected on pigs by agents from the Man Nai and Meng Lieh stations.

Personally, *i.e.* in their face and figure, the Shans resemble the Japanese, and the women are, to say the least, just as unconventional and fascinating. But there the resemblance ends. The men are lazy, good-for-nothing fellows, who never, unless absolutely obliged, do any work. The women toil during the summer in the rice-fields, and when at home are industriously employed weaving cloth. Their costume is very pretty, consisting of a turban embroidered with gold thread, a short tight-sleeved jacket, a long white petticoat, and a coloured skirt. Their skirts are so much more becoming than the ugly misshapen trousers of the Chinese women, and it is this difference in costume which strikes the eye of the traveller coming from China.

At Meng Wu the girls were already providing themselves with cotton-seed balls, and I was pelted with these love-missiles whenever I made my appearance in the valley. They were not, of course, intended to convey any message to me; but at the festivities which take place during the Shan New Year these coloured balls play an important part, the unmarried girls throwing them at the young men of their choice. By continually catching or missing them the youths show their preference, and marriage engagements are the result. At other times this game resolves itself into a mode of flirtation, the one who misses the ball having to pay a forfeit to the thrower. All the Shan boys spend a part of their lives in the village temple, where they learn to read and write, and become lazy.

On leaving French territory, the route was, to use a French word, *épouvantable*, and during the greater part of the year must be absolutely impassable. We followed the valley of the Nam Wu up to its source, and then struck over the dividing range which forms the frontier. The evening was drawing in, when one of the horses got embedded in a mud-hole, and we had great difficulty in extricating him. We got him out at

last, and made a fresh start. But a huge slippery boulder lying right across the path at a particularly narrow spot, proved a stumbling-block to the first mule, that slid and rolled down the side of the ravine until stopped by the long grass. It took some time to get the poor beast with its burden back to the road again, and then the muleteers—both young fellows—gave up and commenced to cry. I told them to camp out, and having seen the whole party comfortably around a blazing fire, which was soon made, I started on foot, with my servant, to find our proper stopping-place, Paka. It was by this time quite dark, the path was full of holes, and we had to find our way sometimes by the aid of matches.

"HSIANG TAN" LOLOS OF IWU.

We came at last on the telegraph poles, and then to the stone marking the frontier. A few li further on we found the village of Paka. Here I easily arranged with four or five Chinese to go back and help our caravan; and by 11 p.m. the last of the party had straggled in, and we were once more in good spirits. I was really glad to get back into Chinese territory, for I felt that the hardships and difficulties encountered in French Laos were barely compensated for by the courtesy and hospitality of the acting political agent and his colleague at Meng Wu.

From Paka we followed a fairly good road leading level for several days, and planted the whole way with telegraph poles. The mountains had been cleared by fire of their dense forests; but though the aspect

was not so grateful to the eye, we were glad of the change. The inhabitants of the villages we passed were either "Han Pa I" or Chinese, hospitable but uninteresting. Some of the latter were formerly beggars of Semao, who, having saved a little money by industriously following their vocation, had emigrated to these parts, and were eking out a wretched though perhaps honester existence by cultivating the little watered valleys.

I must not forget to mention a labour-saving device, used by the "Han Pa I" in hulling grain, of which I secured two photographs. The apparatus consists of a wooden log, hollowed at one end, and with a piece of hard wood fastened through the other. This log is evenly balanced, and a stream of water is turned on to the hollow end, which when full sinks down, empties itself and rises again. The other end, falling continually into a receptacle containing grain, performs its work by gradually loosening the husk.

We crossed the Nam Ban again at Na mifa. This time we forded the river, there being nothing in the shape of a ferry so far as I could see. It required a knowledge of the locality which we did not possess, to avoid the deep places, and several of our party wanted drying that evening. From the Nam Ban the country presented its old aspects—hills, valleys, and zigzag roads, and the villages were mostly Chinese. By the occasional use of quinine, the efficacy of which as a preventative of fever needs no endorsement, none of us were ill during the trip; and we arrived back in Semao on December 25, Christmas Day.

II. Meng Lien.

The object of my trip was to obtain as much interesting material as possible for the Semao section of the Paris Exhibition; and my intentions were to visit, if time permitted, the country of the Kawas—that savage people of whom we had heard so much, but knew so little. March and April are not the months *par excellence* for travelling in Yun-nan. They usher in a period of dry and dusty weather, with irritating wind, which continues until the rainy season. The sun appears and disappears daily as a round red ball, and the hills are so wrapped in hazy mist as to be almost invisible. Personally, therefore, I felt less pleased than usual at the prospect of a long journey—a feeling intensified by rumours of the head-hunting propensities of the savages already alluded to, whose acquaintance it was part of my mission to make.

Leaving Semao on March 7, 1899, we struck south-west through a region never before traversed by Europeans, along a road followed by cotton caravans coming up from Burma. My own small caravan was composed of seven pack-animals with two muleteers, my servant, a coolie, and one soldier. The muleteers were fine, strapping young Mohammedans, well up in every detail of their calling. To the soldier—

a picked man from the Prefect's Yamên—I entrusted my shot-gun, in lieu of his old service blunderbuss; and the coolie had charge of my snap-shot camera.

Our first stage should have been Nakolo. But, as usual, we were late in starting, and were obliged to make a *détour*, and put up for the night in the little Lolo village of Lao Wang-chai, 30 li out from Semao. The Lolos proper, who call themselves Ni Su, exist in the Semao district in small scattered villages only, and are very much mixed by

SHAN GIRL OF MENG LIEN.

intermarriage with other native tribes, and even the Chinese. Their ancestors ruled over a large part of this province, and there are still powerful independent Lolo tribes inhabiting North Yun-nan and South-Western Szechuan, with whom the Ni Su of Semao claim affinity. They possess a scanty literature, in the shape of written manuscripts, showing evidence of their vanished greatness; but now only the "Perma," or village soothsayers, are able to read and explain their peculiar characters.

We returned to the main road next morning, and continued all day

"up hill and down dale" through charming scenery to Nakolo, a Chinese village of about fifteen houses. From there the road leads up over the Hsiao Lu Shan, a continuation of the Ta-Lu Shan range of mountains which runs from north to south in an unbroken line for miles. We crossed it at a height of 6200 feet, and descended to the town of Mêng Pang, inhabited by "Hua Yao Pa I," or "Coloured Bodice" Shans. Here I obtained my first contribution to the Paris Exhibition—the pretty costume of the Hua Yao Pa I women, which I purchased without exciting suspicion as to my motives.

The Shans, called Pa I by the Chinese, style themselves "Tai," adding the distinctive name of their clan. The following varieties occur in the vicinity of Semao:—

Tai Lu, or Shui Pa I, including the majority of the inhabitants of the Chinese Shan States;

Tai Ya, or Hua Yao Pa I, so named from the coloured bodice worn by the women;

Tai Ne, Hei Pa I and Han Pa I, immigrants from Wei Yuan wearing black skirts, or Shans who have adopted Chinese dress and custom; and

Tai Lem, the people of Meng Lien, or Meng Lem.

In this paper remarks on dress apply particularly to the women's costumes; the men as a rule wear the blue jacket and trousers common to the poorer classes throughout China.

Leaving Meng Pang, we passed through Chen Le-pa, a large plain with a Shan (Lu) population. The Lu women are fond of gay colours, and their dress is very striking. The Liu Shun Tussu, or hereditary chief, was staying in the principal village, and as we were travelling through his territory we sent him cards. This piece of formality brought a messenger from him to wish us a pleasant journey. Our next stopping-place was Hsiao Ho Kung, a small village inhabited by Hei Pa I, immigrants from Wei Yuan, a district north of Pu Erh. These people were very poor, and their houses, instead of being perched up on piles in the usual Shan fashion, were built on the ground, and resembled magnified beehives of the old-fashioned straw-thatched kind. The interiors were dark and smoky, and the entrances so low and narrow that for days afterwards we suffered from sore foreheads and a tendency to stoop.

Villages were not a prominent feature of the country through which we passed next day, and for 30 li or more we did not see a human being. At a place called Tang Pa-shan, where the road overlooks the Mekong valley, there is a settlement of poor Chinese, who manage somehow to make a living from the bare hillsides. Descending to the Mekong, we found the ferry working at a point known as Hsiu Tu-kow, where the distance from bank to bank is somewhat lessened by projecting rocks; but the current is strong, and the water very deep. On the left bank above the river is a straw hut flying the likin flag,

where a tax is collected on all goods passing to and fro. The ferry-charges, which pertain to the Lui Shun Tussu, are high, and must amount to a considerable sum yearly. We were a long time crossing owing to the unwillingness of the pack-animals to enter the boat, and it was evening when we started to climb the steep hills on the right bank of the river. On our way up we disturbed a number of peacock, jungle-fowl, and pheasants that had come out of the dense thicket clothing the hillsides for their evening wrangle and strut. Thirteen hundred feet above the Mekong we stopped at the village of Nan Pien Hsin-chai. The inhabitants, like those of Hsiao Ho-kung, were immigrants from Wei Yuan, and the women wore the same sombre costume—a long skirt of some black stuff, relieved by widths of green and dark-red cloth, a black bodice, and a turban. We noticed many drivelling cretins of both sexes, and more than half of the inhabitants were disfigured with goitre. In Yun-nan one becomes accustomed to the sight of this horrible deformity, but in this little place the proportion of persons afflicted was unusually great. The villagers objected to the presence of our dogs inside their houses, and we noticed that their own gaunt beasts were never allowed to enter. Having remarked the same circumstance at Hsiao Ho-kung, I was at first inclined to attribute it to some superstitious or religious prejudice, but I found it was really fear of the fleas.

AKKA WOMAN WITH PECULIAR HEAD-DRESS.

From Nan Pien Hsin-chai we continued, alternately ascending and descending, passing here a Lo Hei, there a Chinese village, until we struck the Nam Wang, a stream flowing through the Meng Wang plain; and, following up its course, we soon reached that place. Meng Wang is one of those fertile, populous plateaux which occur here and there like oases in the mountainous desert of Yun-nan. When their altitude is over 4000 feet above the sea, these plains are usually inhabited by Chinese, below that height by Shans, whilst various aboriginal tribes

occupy and cultivate the intervening mountain ranges. Meng Wang is an important Shan centre belonging to the Liu Shun "panna." The population of the place—that is to say, of the eight or ten villages scattered over the plain, for the Shans dislike living in large communities—must be nearly 8000.

Leaving Meng Wang, we made but a short stage, stopping at the Akka village of Pasang, which lies up in the hills overlooking the Meng Wang plain. The Akkas belong to the Woni division or offshoot of the Lolo race, and their language is practically the same as that of the Ma He, the poor firewood-carriers of Pu Erh and Semao. I had passed through Pasang on a former occasion, and being recognized by some of

LOLOS DANCING.

the men, we were cordially welcomed, taking up our quarters in the headman's house. The Akka women wear a very picturesque costume. It consists of an open jacket, an embroidered bodice, a very short skirt reaching scarcely to the knees, a pair of cloth gaiters, and a curious head-dress. This last is a towering mass of complicated beadwork on a bamboo and cloth foundation, ornamented with cowrie shells and silver beads, and for height and general prominence the equal of the modern *matinée* hat. It is worn only by the married women, having much the same significance as the wedding-ring. From the day of their marriage they spend their leisure time in its decoration, and when they die it is buried with them, the silver ornaments only being taken off. Except

on special occasions, such as a visit to the neighbouring market of Meng Wang, the hat is covered with a piece of blue cloth to protect it from the sun and rain.

I knew there would be great difficulty in purchasing a complete costume for the exhibition. When the French first established a post at Meng Wu, there were several tribes of these Akkas in that district, and at the request of the French Consul at Semao the Meng Wu resident obtained a woman's dress and hat. But the transaction was distasteful to the Akkas, and resulted in their flight from that part of French territory. Most of their superstitious beliefs seem centred in this remarkable

"PA-I" SHANS PLAYING AT THE LOVE-GAME OF THROWING COLOURED BALLS.

head-dress; and, though I approached the question as delicately as possible, my proposal to purchase one was received with a good deal of suspicion. I did not touch on the subject again until the evening, when, having created a favourable impression by various little presents, I suggested to our host that a costume, including a hat which had not been worn, might surely be found or made in such a large village; and he eventually promised to do his best for me. At eleven o'clock the next morning, when I was preparing to leave, there were no signs of the coveted costume. But soon after my patience was rewarded, for, followed by a crowd of villagers, the headman at length appeared, bringing a complete dress with the hat. He told me, that nearly all the women of Pasang had been engaged during the night

making the things, which lacked the silver beads and buttons only. These I could purchase separately and fix on myself; so I paid the price demanded, which, considering the circumstances, was not exorbitant. Then, bidding these simple people good-bye, I started off to try and find a direct route through the high mountains, known as the Lo Hei-shan, lying to the east of Meng Wang. That day and the next I spent in vain endeavours to find a suitable road for pack-animals through the hills, eventually reaching the "Hsiang Tan" village of Lao Hsiung-tien.

The "Hsiang Tan" are a tribe of Lolos—indeed, they are the only people who style themselves "Lolo," the term being considered opprobrious by the Nisu, Pula, and other tribes. They are allied to the Nisu, and have a similar dress and language. Their customs and amusements are also much the same, but I could find no trace of a literature past or present, and the children of the richer peasants are learning Chinese. Outside one of the houses at Lao Hsiung-tien there was posted a Chinese proclamation issued by the Tussu of Lo Hei. It was addressed to the women of the district, exhorting them to live virtuous and industrious lives, and to refrain from all immoral amusements. Like other Lolo tribes, the "Hsiang Tan" are fond of dancing, which is contrary to Chinese ideas of propriety, and this proclamation was evidently directed against this innocent diversion. But a lecture on conduct to a people so well-behaved as the Lolos was as unfair as it was offensive, for the Chinese of South-Western Yun-nan are themselves unusually immoral. It is this intolerance of harmless customs, coupled with their contempt for native costumes, which has created such a wide gulf between the Chinese as a whole and the aboriginal races of Yun-nan; and it is probably the reason why, during the Mohammedan rebellion, nearly all the hill tribes ranged themselves on the side of the rebels. The Tussu of Lo Hei—the hereditary chief who rules over the district known as the Lo Hei-shan, and who, like the Shan chieftains, owns allegiance to the Chinese—resides at Ta Ya-ku.

Whilst we were at Lao Hsiung-tien, a band of eight cattle-thieves paid a visit to the village. In the middle of the night they entered the house where we were sleeping, and were evidently much surprised to see a foreigner in possession. They did not attempt to molest us, but seemed, on the contrary, glad to get away from a dangerous spot; for, apart from the fact that they are treated as officials, foreigners are credited throughout Yun-nan with superhuman fierceness and daring. In the morning I found that my white metal soap-box, which had been lying on the table, had disappeared.

There being no good direct route to Meng Lien, I turned north to Ta Ya-ku, and struck west along the Chen Pien road, which had been widened and repaired for the passage of the Chinese party of the Southern Boundary Commission. We crossed and recrossed their track several times

on our way to Meng Lien; indeed, by tacitly allowing it to be understood that I was going to join the Taotais' party, I was saved the annoyance of explaining at every village the reasons of my journey. At Nan Ma-chai, our first stopping-place west of Ta Ya-ku, we were awakened during the night by an alarm of fire. Six houses below us were destroyed; but fortunately there was no wind, and the flames did not spread. Fires are of frequent occurrence in this part of the country, sometimes resulting in the destruction of the whole village. Yet despite these warnings and the knowledge that their houses are built of the most inflammable materials, the villagers are careless

HUA YAO PA-I GIRLS OF HSIAO MENG YANG.

with their cooking arrangements, and take no precautions against accidents.

The inhabitants of Nan Ma-chai are "La Hu," a Lolo tribe known to the Chinese as the Lo Hei of Lo Hei-shan. They are akin to the Hsiang Tan, and are to be found spread over a wide area, from the Mekong to the Salwin. In their villages I found no outward evidence of any literature or religion. The Lolos do not build temples. They believe in spirits, and at certain seasons of the year they perform curious rites and offer sacrifices to propitiate the evil or reward the beneficent *nats*.

A very long stage brought us to Shang Ching-chang, a settlement of "Chia Kawa," situated on the top of a mountain 6100 feet above

sea-level. These are the civilized as opposed to the "Yeh" or savage Kawas. In appearance they are tall swarthy people, with oval faces and prominent features, quite unlike the Lolo tribes around them. Their language contains a percentage of Shan words; but they have no knowledge of writing, and I could glean little of their beliefs. Although they disclaim any affinity with the "Yeh Kawas," and have partly adopted the Chinese and Lolo dress, manners, etc., they are a distinct race, and must be, as their name implies, of Kawa stock. Races west of the Mekong are very much mixed. The Chinese settlers, too poor to import their own women from Eastern centres, intermarry freely with the Lo Hei and Hsiang Tan tribes, who in their turn mix with other native peoples. The result is a confusion of language and customs most difficult to analyze, and the fleeting traveller can only endeavour, by careful comparison, to guess at the parent race of each tribe. It is improbable that there are more than five or six distinct races in Yun-nan, though there are nearly a hundred differently named tribes.

The following day we passed quite close to the village of I Sung, marked on the maps as Chen pien, the capital of the Chen pien prefecture. The yamen of the first prefect, a Cantonese, was built down in the Meng Lang plain; but he was carried off by malaria, and his successor removed the official residence to a healthier spot on the hills, 30 li away. The quality of the opium, which is extensively cultivated on the hillsides in this district, has quite a reputation amongst consumers in South-Western Yun-nan. This year the crop will be a failure, owing to the want of sufficient rain during the eleventh and twelfth Chinese months. We passed through two hamlets where some Hunan men have settled down with Lo Hei wives, and off the route were several Akka villages. In the afternoon we ascended to a height of 7000 feet, our highest point during the trip. From this elevation we could see some big mountains to the west, the Kung Ming-shan range, which forms the Burma-Yun-nan frontier, being plainly visible no great distance away; and behind it, showing dimly through the haze, a higher range, at least 9000 feet above the level of the sea.

On our arrival at Nan Tieh, a Lohei village, we met a caravan of cotton in charge of some Mahommedan muleteers, who had come from a place in Burma, north-west of Meng Lien, and were making their way by a roundabout route to Ta Ya-ku. They had been obliged to skirt the edges of the Kawa country, and told me many stories illustrative of the fierceness of this head-hunting tribe. At present only the Shans are able to enter the Kawa country without being molested; and some Chinese officials, whilst making a preliminary survey of the frontier which runs through their territory, were only recently attacked, and obliged to flee for their lives. The Kawas build up near the hilltops, and their villages are so arranged that the only entrance is through

a tunnel-like passage cut into the solid earth. Their houses are cavern-shaped structures, made by digging a hole in the side of the mountain and erecting a rude porch outside. They cultivate mountain rice and maize, and make a curious cloth of strong texture which they sell to the Shans. Their ordinary costume, men and women, is a ridiculously small loin-cloth and a pair of huge earrings; but when visiting the markets, they fold a piece of cloth skirt-like around their bodies, and the women wear in addition a loose short-sleeved jacket and a pointed cloth hood. These and many other details I learnt from the Mohammedan muleteers. They were British subjects, and

THE TEN HILLS OF IBANG, SHOWING TEA-TREES.

must have been proud of the fact to acknowledge it, for they were dressed exactly like other Chinese, including the queue.

We left the main road at Nan Tieh, and struck south across a deep valley and up the opposite hill-side to a "Chei Kru," Akka village. This is a variety known to the Chinese as "Ping Fu," or Level-heads, from the women wearing a less imposing head-dress than the "Chien Fu," or Pointed-heads. I tried hard to procure another dress, but failed. My *modus operandi* in this instance was as follows: the headman of Nan Tieh, our stopping-place, was a Lohei well known to the Akkas of the village, and I persuaded him to start some time before us in the morning, and to try and arrange for the purchase of a woman's costume. I made no limit as to the price of the articles; he was to be remunerated for his

trouble if he failed, and to receive a stated sum if he succeeded. I think he understood that my motives were quite friendly, and tried honestly enough to earn his reward; yet the scheme had no result, except to bring the whole of the villagers out to the roadside to watch us pass. We stopped to rest at Chiu Fang, a Lohei village, the capital of a small hill district ruled over by a Chinese, who is married to a native woman. He was away with the Chinese frontier party, at the head of a number of his subjects; but his son had returned the previous day, and gave us a full account of the progress of the commission.

The Tao-tai of Pu Erh was in charge of the Chinese party, and the British officials must have been impressed by the number, if not by the martial appearance, of his following. Soldiers were summoned from all parts of the prefecture to act as his escort, whilst a percentage of the inhabitants of every little village along or near the route accompanied him headed by their local chiefs. The armament of this motley crowd was varied, consisting of weapons old and new, from the latest-pattern Winchester (manufactured in the arsenal at Yun-nan fu) to the spear, trident, and blunderbuss. Everything was working smoothly, we heard, except for the little difficulties connected with the division of doubtful territory; and the British party, with their smart escort of Sikhs, created a very favourable impression. We noticed many proofs, in the shape of bottles and empty preserve-tins, of the recent passage of foreigners through the country; and once we came upon the coloured picture, "Joseph's Dream" (*Truth* Christmas Number, 1898), stuck up in a conspicuous place outside the hut of an untutored savage. The contrast in this wild wilderness was startling.

Thieving bands of Kawas were known to be in the vicinity of Chiu Fang, as a few days before a neighbouring village had been raided and some cattle driven off by these savages, who are said to be able to cleave a pig in two with one stroke of their keen-edged swords. When we left, our young host insisted on sending eight men as guards, who accompanied us down to Meng Ping, a plain inhabited entirely by Shans. Like Chiu Fang, it is one of those little semi-independent communities so common in this region, appertaining to no particular state, but paying a nominal tribute either to the Chen Pien prefect or to the Tussu of Lohei. These small districts are under chiefs who have been given control of morsels of territory as reward for their help to the Chinese at some critical period. The headman of Meng Ping was with the Chen Pien prefect at the frontier. Like many of the Shans, he has the reputation of being invulnerable.

The belief in the potency of charms, etc., is very widespread amongst the lower class Chinese and the Shans in this part of Yun-nan. The latter, in particular, have all kinds of amulets to ward off evil, the gem of their collection being one which confers invulnerability on the wearer.

This useful quality may also be obtained, I was informed, by undergoing a very painful process of tattooing. During my trip I was shown a "dragon's nest"—which looked like a bit of the horsehair stuffing from a foreign saddle—guaranteed to render the purchaser's house safe from fire; and a "female deer's horn," which would enable the fortunate owner to walk great distances without fatigue. Not being a landed proprietor or a professional sprinter, I had no use for these things; and though I entered into negotiations with several people for

"LEVEL-HEAD AKKA" WOMAN.

the talisman which would render me invulnerable, none of them were willing to stand the test of Western scepticism—a revolver at thirty paces—even though I offered them an enormous sum and a handsome funeral in case of accident.

We travelled through some wild country next day, and towards evening came again to the main road. At one place we saw, working in the fields, some Kawa girls, who appeared to be *in puris naturalibus*; a closer inspection, however, revealed the customary loin-rag. I

might have spent the night in one of their villages, but my Shan guide advised me not to do so. He said that it was usual for strangers to take a guard of Shans with them when intending to visit the Kawas in their houses; so, leaving the mountains, we descended to the Shan town of Nang He. From there the road was level the whole way to Meng Lien.* The principal town of Meng Lien is situated on the side of a sloping hill at the northern end of a large cultivated plain, 3600 feet above the level of the sea. The mountains around are covered with thick forest, and the plain is watered by the Nam Lien, a cool, limpid, and sluggish river, which runs at the foot of the incline on which the town is built. It was certainly the prettiest place that we had visited during our trip. In the plain, nestling amongst the woods, are many other villages, and the total population must be nearly 20,000.

The district of Meng Lien comprises a large tract of territory, whose western boundary forms for some distance the Burmese frontier. The present Tussu of Meng Lien is a young man of twenty-one, on whom the Taotai, when passing through on his way to the frontier, conferred civil rank of the third class. He was married the day we arrived, and invited me to the wedding festivities, which were taking place at the bride's home some distance away. But I was anxious to visit the market on the morrow, and was obliged to refuse. In an interview with him, I learnt that the boundary commission had started at Meng Ah, a point south-west of Meng Lien, and were working south. That part of the frontier running through the Kawa country has not been defined, and will be left over until next year. Unless some arrangement is made by then, fighting between the savage inhabitants and the Boundary Commission is, I am assured, inevitable, and the Indian Government will probably despatch an expedition to the frontier. We found accommodation in a temple near the Tussu's yamen, and the chief bonzes, the junior priests, and students quartered in the building received us with curiosity, but cordially. All the Shan boys enter a temple at an early age, where they learn to read, write, and chant prayers. Should they elect to stay, they are gradually promoted, and so many pupils are entrusted to their care. Every morning these youngsters may be seen chanting the contents of their books aloud to their instructors, or pricking letters on to palm-leaf booklets with a steel stencil.

Amongst the other races of this part of Yun-nan the immorality of the Shans is proverbial; but it is not at first apparent to the passing stranger, who is often at a loss to know how such a bad reputation has been established. The fact that both sexes mix freely together, and are on terms of social equality, however contrary to Chinese ideas, does

* Meng Lien, or Meng Lem.

not offend the foreigners' sense of propriety. Further acquaintance, however, will show him that the Shan girls, outwardly so pleasing, modest, and industrious, are utterly wanting in virtue; whilst the men are dissolute, even the students in the temples throwing off their priestly dress and demeanour at nightfall. The unmarried women are allowed the most absolute freedom, and have many lovers; but once married, they become, as a rule, good and faithful wives, and take a prominent part in the management of the household.

It was very cold in the early morning at Meng Lien, and I remarked that at low altitudes the temperature was much higher during the day and lower at night than on the hills. During our stay in the temple

A SHAN HOUSE.

we were awakened regularly at daybreak by the priests and students, who, kneeling in front of the great gilt Buddha, yelled their morning orisons with more vehemence than harmony. Then the women of the place entered in twos and threes, and, first removing their turbans, also performed their devotions. They bring with them offerings to the gods—little balls of glutinous rice and a handful of chillies. We visited the market, which is held once every six days at Meng Lien, and is frequented by many different kinds of people, some of whom come from distant places. I obtained several curiosities, including the gala dresses of the Kawa and Lohei women. Amongst the foreign things for sale on the stalls, I noticed all sorts of woollen, silk, and

cotton piece-goods, in much greater variety than can be found at Semao; condensed milk, candles, umbrellas, lead-pencils, and buttons. These articles are brought from Mandalay or Rangoon by Shan traders, who frequent all the big markets of the Chinese Shan States. They never go to Semao, fearing the intolerance and jealousy of the Chinese merchants there.

Leaving Meng Lien on the morning of March 21, we crossed the plain in a south-easterly direction, and found ourselves once more amongst mountain ranges—here covered with dense forest. About noon we encountered a forest fire, and had barely time to rush past the point of danger, the flames already licking the long grass at the side of the narrow path. The last horse threw his pack into the fire, and in rescuing it one of the muleteers burnt his hand rather badly. Further on huge branches of fallen trees, still burning, blocked the path and stopped our progress. We were on the slope of a mountain, and could go neither up nor down. Behind and below us the woods were on fire, and it needed our united efforts to move aside the blazing logs and start on again. Then the strong wind rushed the flames up in front of us from below, separating three of our party from the caravan. The heat was almost unbearable, and we had difficulty in keeping the horses quiet; but at last, after an anxious time, we were able to pass through, and made all haste to get away from the burning area.

We rested awhile in a Kawa village, the villagers belonging to the semi-civilized kind to be met with on the outskirts of the Kawa country. From one of the men—a ferocious-looking old savage, with unkempt hair falling over his shoulders—I obtained a short vocabulary of their language, my desire in this direction being limited by his ignorance of Chinese and my imperfect knowledge of Shan. He accompanied us as a guide to the next Shan village, and I bought from him an old fuse-gun, made locally, the stock of which was smeared with blood and ornamented with the feathers of birds which he had shot. Our route led through a mountainous barren country with few inhabitants until we arrived at the Pu Meng-shan village of Nong Kang, situated in the centre of an important tea-district. This place belongs to Meng Che, but the adjacent villages of Ching Mai, Meng Ping, and Man Kieng form part of the territory ruled over by Mr. Yang, a Chinese merchant of Ta Ya-ku, who was given official rank and obtained a grant of land for his services in the war against the hill tribes of Lohei. These three villages were lately made over to him by the Meng Che Tussu, with whom he is on very friendly terms.

From Nong Kang we descended to the Shan town of Meng Mang, situated in a big plain. Game of every kind is plentiful in the thick woods which cover the hills around, and on leaving the plain I obtained a shot at a peacock. Between Meng Mang and Meng Che there are no villages near the road, and as we arrived late at the summit of the high

range which divides these two plains, we decided to camp out. We found a pleasant sheltered gully with grass and running water, where we spent a good night, the atmosphere at that height (5500 feet) being dry, with no sign of the heavy mist which nightly envelops the low-lying plains. The weekly market was in full swing when we arrived the following morning at Meng Che. I noticed the same variety of foreign goods exposed for sale as at Meng Lien, and amongst the crowd of frequenters were some Hunanese pedlars, with their usual stock of matches, percussion-caps, Chinese buttons, and the odds and ends peculiar to a pedlar's stock-in-trade.

From Meng Che to Meng Hai it is only 50 li. On our arrival we

AKKAS OF CHEN YANG, WEST OF MEKONG.

found hundreds of Shan men and women and a few Chinese crowding the market, and preparing to camp under the small straw sheds which serve as scanty protection against the sun and rain and heavy night dew. The market was to be held next day, and these people, who had come in from a distance, would be ready to wrangle and barter at an early hour. At night I visited the place again, and found many of them lying around on the ground fast asleep, while others, including most of the Chinese, were huddled up near their opium lamps. Before daybreak the market was astir, and people were coming in from all directions. There are two roads from Meng Hai to Kiang Hung—one through the Meng Sung tea-districts, the other curving round to the south in a

semicircle. Having already been over the former, I this time chose the more southerly route, which led for some distance through tea-plantations. Outside one of the large villages which we passed were the corpses of six Chinese surrounded by vultures. These men belonged to one of the numerous small bands of robbers and horse-thieves living around Semao and Pu Erh, who overrun the Shan states during the dry season, attacking small caravans and stealing horses and cattle. Sometimes, as in this instance, punishment overtakes them before they can get away with their booty; but it was a common occurrence during our trip to meet parties of villagers armed with spears or old guns, looking for lost cattle. The Shans, when they catch these thieves, cut off their heads without reference to the officials. At one place *en route* I saw the headless bodies of two horse-thieves lying out beyond the village limits. During the morning we twice forded the Nam Ha, a stream which, rising above Meng Che and flowing through both that and the Meng Hai plains, empties itself into the Mekong at Kiang Hung. Then a steep ascent brought us to Nang No, a "level head" Akka centre of three or four good-sized villages. The district produces a lot of tea of excellent quality, and the inhabitants were well-to-do and would listen to no suggestion for the purchase of their garments. At I Bang and I Wu the Chinese make a close distinction between the tea-leaves according to the age or time of picking, and they have gained a reputation by certain of the finer young qualities; but in all other districts the natives wait until the trees have put forth all their leaves before commencing the harvest. The tea is bruised and dried after picking, and sold loose to traders, who carry it up to Semao, where it is carefully sorted into three qualities. The output of the tea-districts west of the Mekong is many times greater than that of I Bang and I Wu combined, amounting to about 25,000 piculs annually. There were two curious gates to the village where we stopped. On the top of the first, facing the road, was the skin of a dog with head intact, its mouth open and its teeth grinning defiance to the evil spirits who are always so eager to enter Akka villages. The other gate, which was of curious make, had as ornaments, and probably with the same idea of scaring away ghosts, the model of a rat, and the nude figure of a man roughly carved from the branches of a tree. I inquired carefully as to the beliefs or religion of the Akkas, but could get no information beyond the string of legends about good and evil spirits common to most of the races in Asia; even these would have been interesting, but that no two people could relate them alike.

At Nang No, as elsewhere, the Akka women work hard in the fields and at home; but the men have acquired a facility for loafing foreign to the natives of poorer districts, and which must be put down to the pernicious influence of wealth. The altitude of Nang No is 5800 feet above sea-level, and we climbed another 300 feet

before commencing the trying descent into the Kiang Hung plain, where we arrived at mid-day. In the afternoon we passed Kasai, the residence of the prince, who is constantly surrounded by a numerous body-guard of men drawn by conscription from the villages in the plain. The people were in a very excited state. It was rumoured that the powerful Meng Che Tussu intended to come and attack them; the prince had also received news that the Tao-tai was going to pay him a visit on his return to Pu Erh from the frontier. We stopped for the night at Katlang-kai, near the Mekong. After the freshness of higher levels, we found it unpleasantly warm in the plain, which lies at an altitude of 2200 feet above the sea only—the lowest point of our

A SHAN TEMPLE AT CHEN LE-PA.

journey. Next day we ferried the Mekong, and, crossing the dividing range, slept at Man Hoko in the plains of Hsiao Meng-yang. The inhabitants are "Hua Yao Pa-i," a Shan tribe which I have already described; and I purchased without difficulty another of their costumes, trimmed with silver and elaborately embroidered.

The hills around Hsiao Meng-yang are covered with virgin forest, the haunt of wild beasts—the elephant, tiger, panther, wild buffalo, bear, and pig, and feathered game in great variety. Fifty li to the north-east of the plain is the tea-district and former city of Yulo, now an unimportant village mentioned in old Chinese chronicles dealing with South-West Yun-nan.

Leaving Man Ho-ko, we were undecided whether to travel slowly and camp out for the night, or push on to the next village, 90 li distant; but an adventure which befell us whilst we were at our mid-day meal obliged us to adopt the former plan. We had travelled during the morning through thick woods, following up the sinuous course of a small stream. There were no houses of any description along or near the road, and the only human beings we met were six Shans. We stopped at noon in a suitable spot, and as usual the horses were turned loose to graze, whilst the muleteers and men prepared their rice. Presently we heard one of the horses neighing, and, as they were generally too hungry to make a noise, one of the muleteers went to see the cause. To be brief, six of our animals had been stolen by the Shans we met the same morning. They had followed us, seized their opportunity and six of our horses, and were on their way back to Hsiao Meng Yang. Fortunately my men were all strong, active fellows, and, picking up their weapons, they were soon in full pursuit. At first I disliked leaving the baggage unprotected, but I eventually joined in the chase. It was long and discomforting; but the nature of the ground aided us, whilst it prevented the tired horses from going very fast, and my men at last overtook the thieves. The fighting was mostly over by the time I arrived, for the Shans were no match for our muscular Mohammedans, and after receiving a few hard knocks they cleared off into the bush before our firearms were brought into play, though the soldier in his zeal sent two charges of small shot after them from my gun. However, there were no casualties, and, having recaptured the horses, we returned perspiring but triumphant to our interrupted repast. The thieves belonged to the local class, who, though very cunning, are as a rule not courageous enough to be really dangerous.

In the afternoon we let off a dynamite cartridge, purchased at Meng Lien, in a deep pool near the road, and obtained about 10 lbs. weight of delicious fish. We camped out in an open space, first destroying the long grass all around, and then lighting four big fires to keep off predatory wild beasts. We were still at a low altitude, and a thick mist enveloped us from sunset until after sunrise the following morning. From our camp we ascended, and found ourselves once more amongst Chinese villages, and next day arrived at Pu Teng, the capital of the Shan state of that name. The town lies, as usual, in a long low plain (altitude 3000 feet), watered by the Ta Keng, a tributary of the Nam Ban river.

The distance from Pu Teng to Semao is 110 li, two short stages over hilly country, but a person unencumbered can cover it easily in one day; so, leaving my caravan to follow on slowly, I started from Pu Teng shortly after sunrise, and arrived back at Semao in the afternoon, after an absence of thirty-three days. Except the little mishaps which I

have mentioned, we met with no trouble or sickness *en route*. The trip was an enjoyable one, and the results will most probably be on view to visitors to the Chinese Court of the Paris Exhibition, 1900.

Before the reading of the paper, Admiral Sir W. J. L. WHARTON (Vice-President) said: I will call upon Mr. Warington Smyth to read the paper we are going to hear this evening. Mr. Carey is unfortunately not here, being still in China, and we are very much obliged to Mr. Smyth for reading his paper. Mr. Smyth has been in the southern parts of the Shan States, and will therefore be able to read the paper with sympathy. Mr. Carey is an officer in the Chinese Customs, stationed in the western part of Yunnan amongst the Shans; and the paper describes expeditions made from his centre at Semao to the westward, over the Mekong, and into British territory over the Burmese frontier.

After the reading of the paper, the following discussion took place:—

Lord LAMINGTON: I think I may safely say that the paper gives a very close and succinct description of the northern portion of the Shan States. Many of the scenes depicted remind me very forcibly of my own experiences when I once went through the southern portion of the Shan States. Of course the chief interest at that time was political, as to the possible destination of the states, to which of the great Powers they would belong, but that is not a point to be touched on here. From the density of the population, it is to be supposed that they are very fertile, and could be rendered more so under different conditions; the time is coming when we shall see some European power in control of that portion of Yunnan. Travel is certainly at times very trying, and I remember well, after the rains, how excessively difficult it was to surmount the continual hills that lie in the way; they become so greasy as to be impracticable, until the sun comes out strong enough to dry up this greasy mud. I also remember the instrument used to thrash out the paddy which was described in the paper; it is rather ingenious and very simple. The water falls into a hollow log, and as it empties, the pestle falls on to the grain, removing the husk. I have no other remarks to make on the paper. I am very glad to hear again of these regions, for I was able to spend a very happy portion of my life travelling there, and I think we all owe a debt of gratitude to Mr. Carey for his having compiled his experiences for our benefit.

Major A. C. YATE: In the autumn of 1887 I was serving in Burma, and was instructed to proceed to Mandalay, and report myself there to the Intelligence division. On arrival I was told I should either have to go to Bangkok and travel northwards to explore the country, or join one of two Shan expeditions about to annex the territory between the Mandalay and Salwin rivers. Ultimately, I went with the northern Shan expedition under Major (now Colonel) Yates, R.A. The southern column was under Colonel Swetenham. We took, more or less, the route now followed by that railway to the Kunlon ferry on the Salween that many people think will end on the Yangtse Kiang. We crossed the great Gokteik defile, one of the most difficult points on the projected line, several hundred feet deep, and very difficult for engineers to negotiate. They have, however, negotiated it, and are now putting a bridge over it. Thence we went to Thibaw, where we were entertained by the well-known Tsawbwa. In his own territory he had been accustomed to regard the life of his subjects as of little importance. During a visit to Rangoon some twenty to thirty years ago, he had two or three of his men put to death, thereby bringing himself within the reach of British law. However, he received timely warning to clear out, which he did; and I

have understood that his gratitude to the British Government for not interfering with his prerogative is one reason for the friendly attitude which he has always adopted.

Some of the tribes through whose territory we marched gave us trouble, but as we had strict injunctions not to fight if we could avoid it—we had 150 men and two guns—we tried the pacific policy as far as possible, although at Theinni the Tsawbwa, who had approached the Chinese with a view to obtaining their aid in checking us, only sent in his submission when we were within a few miles of his chief town. From Theinni we went about 150 miles to the Kunlon ferry on the Salween. The road had fallen into complete disuse. The pictures which I have just seen on the screen reminded me of many things I saw and heard of there. As intelligence officer I had to find out what I could, and any one who has been amongst Shans will understand the difficulty of getting intelligence out of them. I made careful note of the Salwin suspension bridges, however, from their descriptions, and I now see that what they told me was correct.

Having reached Kunlon, we had done our duty, and having annexed from 10,000 to 15,000 square miles of territory, we returned to Mandalay. As we marched in, Sir George White came out to meet us. The British part of the escort consisted of fifty Munster Fusiliers, and never did men look fitter than they did, after their three months' hard work. That, very briefly, is how we annexed the territory between Burma and the Salween. It was done almost unnoticed.

Mr. Warington Smyth: I feel that one duty I have to do is to explain shortly the nature of these innumerable tribes. Mr. Carey, in his most interesting paper, mentions a great many names, which must have left you in a mixed condition as regards the tribes mentioned; for practical purposes there are two main divisions—the first the Ka, who call themselves Woni, such as the Akka people and several other very primitive tribes, who are practically the aborigines of the country; and, secondly, the Shans, who are called by the Chinese Pa I, and who call themselves Tai. They are found all over Indo-China from 7° to 28° N. lat., even to the headwaters of the Irrawaddy valley. Many of these have been described by Mr. McCarthy, the late General Woodthorpe, who is missed so much all round the Indian frontier, Mr. J. G. Scott, and other travellers who are mostly unfortunately unable to be present this evening, or we might have heard more of this, to my mind, most fascinating country.

Mr. Carey remarks on the extraordinary credulity of these people with regard to talismans. I obtained one once from the head of a monastery, a very valuable little piece of wood, which defends me from falling trees and sword-cuts. I tried to get one to protect me from motors and bicycles, but he was unable to supply the want. I will not detain you longer, but will give you on the Lao mouth-organ a short piece of music played by the Siamese Shans in the valley of the Me Kong.

Sir W. J. L. Wharton: I am sure we shall all agree that, whatever else the Shans may not have done, they have obtained a certain proficiency in musical instruments. For savage instruments, the tune just played us by Mr. Warington Smyth had a most pleasant tone.

The paper we have just heard is a little difficult to follow with the maps we have here, because to look at the map you would think this a plain country, whereas it is a mountainous one, the mountains running down in long ridges parallel to the valleys. It is necessary to realize that what we have gone through is very mountainous country, interspersed with valleys and fertile areas of tea cultivation. It is an interesting country that created some stir a little time ago, when Major Yate told us it was doubtful where the boundary would be drawn, and it may still possibly come to the front some day. This will be a very valuable

record in the Society's *Journal*, as it contains very many points of interest; and I am sure the meeting will agree with me in communicating to Mr. Carey our obligations for his having written and sent this paper to us.

COLONEL DURAND'S 'THE MAKING OF A FRONTIER.'*

In this book Colonel "Algy" Durand has given a most charming account of his stewardship as warden of the Gilgit frontier for about five years subsequent to the establishment of the Gilgit agency in March, 1889.

No stranger country exists in all Asia than this borderland of mingled magnificence and horror—a land of magnificent mountains seamed with unmeasured glaciers, overshadowing valleys as beautiful as any in Kashmir; valleys whose sweet loveliness warms the author to enthusiastic description, and which are well illustrated by some admirable photographs in the pages of his book. Colonel Durand traversed the country with the eye of an artist, no less than that of a soldier; and as he possesses the gift of an attractive style in writing and a power of vivid description, his book is interesting from beginning to end.

But his administrative duties demanded much more of him than devotion to the picturesque aspects of nature, or to the interests of sport, and his story of the ghastly nature of those political revolutions which occur periodically in the ungoverned wilderness which lies beyond the Gilgit border, is a revelation of the extraordinary mixture of bloodthirsty ferocity and inconsequent light heartedness which still animates the unredeemed portion of Asiatic humanity.

"Half monkey and half tiger" is Durand's estimate of Chitráli character. A Chitráli, or Kanjuti, chief will sell his own people into slavery; he will murder all his nearest relations with ruthless ferocity; he will face death (when he must) with dignity and pluck; and he will (at least the Chitráli will) charm a European visitor by his frank, cordial good nature, and his fascinating manners. The "monkey" is usually predominant; but no tiger that ever lived can equal his deliberate, murderous bloodthirstiness when he has accounts to square with his own familiar friends and family.

Opinions may possibly differ as to the practical political or military gain of such advanced positions as Chitrál, but there can be little doubt about the moral responsibility of a government that might extend its hand, and yet would leave such a country to stew in its own seething cauldron of misrule.

In 1888 there were already gathered together thousands of Kashmir

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* 'The Making of a Frontier.' By A. G. Durand. London: Murray. 1899.

soldiers, with little discipline and with most inadequate military arrangements made for their welfare, prepared to enforce the rule of Kashmir in those border districts which had been conquered or annexed by the Sikhs, but which had broken loose from Dogra ascendency. For the time being peace was patched up; but such patchwork never lasts long on the frontier; and it fell to Durand in 1891 to reassert the rights of Kashmir in Hunza. This story he does not tell; it has been already well told by Knight; but he does tell of those proceedings which led to our occupation of Chilas, and this part of his book is sufficiently instructive. It illustrates forcibly the difficulty of drawing a line when once a frontier is overstepped, and we begin to meddle with "the tribes."

Colonel Durand's suggestion that in 1888 (this was before the inauguration of Imperial service in the native states) a thousand Cossacks might have made their way to Srinagar to the astonishment of the peaceful inhabitants of the Kashmir valley, is rather startling to any one who has digested his description of the nature of trans-Gilgit frontier roads. We know now that fifty good fighting men could certainly hold such roads; and it is hardly credible that Sikhs, Gurkhas, and Dogras were reduced to a condition of such utter imbecility by bad management as to have rendered it impossible to maintain a defensive position in such a country against such a force.

T. H. H.

THE OCEANOGRAPHICAL AND METEOROLOGICAL WORK OF THE GERMAN "VALDIVIA" EXPEDITION.*

By Dr. G. SCHOTT, Deutsche Seewarte, Hamburg.

[Abstract of a paper read at the British Association for the Advancement of Science, Dover, September 16, 1899.]

I CONSIDER it a great honour to give an account of the *Valdivia* expedition in this assembly, especially under the presidency of your chief authority on oceanography, Sir John Murray.

England has a considerable interest in our German deep-sea expedition;

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* The *Geographical Journal* has given several notices of this expedition—in vol. xii. p. 494, on the ship and the scientific staff; p. 569, on the voyage from Hamburg to Granton and Canary islands; in vol. xiii. p. 297, on the rediscovery of Bouvet island; on p. 336 will be found a chart showing the track of the *Valdivia* in the Southern ocean along the ice-boundary, and also the deep-sea soundings; and finally, p. 640, an extensive summary of the scientific work, also of the zoological investigations, of the whole voyage between Cape Town and Sumatra. We give here some concluding remarks relating to the above-named inquiries.

some important items of our equipment were made in England, and the leader of the expedition, Prof. Chun of Leipzig, has pointed out on several occasions how valuable the advice of Sir John Murray has been to him. Moreover, in the summer of 1898, when the *Valdivia* was starting on her voyage, she anchored at Granton, and all the members of the expedition enjoyed on this occasion the hospitality of the scientific men of Edinburgh; and on her return, in April, 1899, the *Valdivia* anchored here just outside Dover for a day. I did not then think that I should six months later be in this very place to give an account of the oceanographical and meteorological observations which had been made under my care.

1. Soundings.

At most of those stations where important oceanographical or zoological work was to be done, the depth of the sea had first to be sounded. Even where, according to the charts, the depth of the sea was known more or less accurately, we had first to sound, to ascertain the nature of the bottom before the nets were let down, and also to guard against surprises. Especially in recent years local shallows have been found in the deepest regions, banks of only 300 fathoms or less. For example, on October 17, 1898, we were in the South Atlantic, between Great Fish bay and Cape Town. The charts led us to expect at least 2500 fathoms, so we confidently let the great vertical net down to 800 fathoms; however, it came up full of foraminiferal sand, showing that it had been on the ground. Soundings on the spot showed a depth of about 500 fathoms, but the following day we obtained nearly 2800 fathoms, the area of the discovered submarine bank being therefore doubtless very small.

It is unnecessary in this country, which by its surveying ships and cable steamers has taken many thousand deep-sea soundings in all the oceans, both by hemp line and by steel wire, to give a description of the methods of deep-sea sounding. I need only mention that we had two sounding-machines, a French apparatus by Le Blanc, used by the *Belgica* and other ships, which, however, did not prove satisfactory in a rough sea, and needs alteration; and an American machine on the Sigsbee principle. The latter worked excellently; we have sounded with good results even in a whole gale. There were some new features, notably an electro-motor, which wound up the wire with quietness and certainty, and is much to be preferred to the steam-engine. In polar regions, especially where steam-pipes are liable to freeze, electric power seems the best; we made use of it for the first time for this purpose.

The piano-wire employed on our sounding-machines was of German manufacture, and of marvellous strength; several times we unintentionally brought the iron 60-lb. weight up again to the surface from depths of about 3000 fathoms in a heavy sea without breaking the wire. In the latter part of the voyage the Sigsbee machine was the most frequently used, and during the whole nine months we only lost 20 fathoms of wire, and that really through want of attention.

Most of the new deep-sea soundings were obtained on the route Cape Town—Bouvet island—ice-limit—Kerguelen, where our expectations were exceeded first as regards the possibility of working. On account of the prevailing stormy weather in the higher degrees of southern latitude, we did not expect to make a great many soundings; nevertheless we managed to sound forty times on this route in deep water where scarcely a single sounding existed before. The results were rather surprising.

We went from Cape Town towards the south quite sure of encountering lessening depths, and of being able to dredge beyond 50° S. lat. in a depth of 1000 to 1500 fathoms, or even less than 1000 fathoms. We discussed this subject every day, so much has been written about the antarctic plateau, and even the Crozet islands, Prince Edward island, and Kerguelen have been considered outposts of this shallow sea. However, the result proved to be contrary to our anticipation; already between Cape Town and Bouvet we found sometimes more than 2500 fathoms and a very irregular bottom (even up to 1480 fathoms), whereas Bouvet island is placed on a large base of little more than about 1500 fathoms. But as we went on towards the south-east, we met with a succession of surprises during the entire course through the ice. With the exception of two soundings of nearly 2200 fathoms, we got always, up to Enderby land, depths of more than 2500 fathoms, and often more than 3000 fathoms (greatest depth, 5733 metres = 3135 fathoms, in 58° S. lat. and 38° E. long.).

When going northward from Enderby land to Kerguelen, we found an increasing depth—more than 1000 fathoms, more than 1500 fathoms, and sometimes more than 2000 fathoms, and on one spot, where we were obliged to break off, more than 2300 fathoms. As between Cape Town and Bouvet, we found a very irregular bottom; and it is remarkable that the shallow sea between Kerguelen and McDonald island and Heard island, which was investigated by H.M.S. *Challenger*, has a very steep slope down to the antarctic basin.

We may conclude that at least between 0° and 50° E. long., southward from lat. 55° or 56° S., there is a fairly regular and very deep antarctic depression, with no suggestion of a plateau.

It is hardly necessary to point out the geographical or geophysical importance of the new soundings, but I may remark that the mean depth of the south polar sea must be somewhat greater than has hitherto been supposed. In 1896 Dr. Karstens estimated the mean depth at 800 fathoms, which is much too little. There is the same difference as in the case of the arctic basin, where, as we know from Nansen, the depths are greater than they were thought to be.

The voyage from St. Paul and Amsterdam towards the north to Padang resulted in much that is interesting. By keeping our route to the east, we went just between the soundings of the *Gazelle* (1875) and of the *Egeria* (1887). Here our soundings gave varying results compared with those of further south; there deeper than we expected, here shallower. For instance, in 30° S. lat., 88° E. long., instead of 2700 fathoms as expected, we got only about 1100 fathoms.

The great depths of the eastern part of the Indian ocean do not reach so far to the south-west as we believed. We found between the Maldive and Chagos islands much smaller depths than we expected; further, we explored the most interesting inland sea between the Nias islands and the west coast of Sumatra, and sounded nearly all the passages; then we examined the slope of the ground at the northern part of west Sumatra by a series of soundings, which, at a distance of 60 sea miles from the land, showed over 2800 fathoms; and, lastly, the slope on the south-west edge of the Agulhas bank down to the deep sea has been examined.

The following table contains all our deep-sea soundings except those between Cape Town—Bouvet—Kerguelen, which are published in this *Journal*, vol. xiii. p. 647:—

LIST OF THE DEEP-SEA SOUNDINGS OF THE "VALDIVIA" EXPEDITION, 1898-99, IN THE ATLANTIC AND INDIAN OCEANS.

N.B.—For the soundings in the Antarctic ocean, see vol. xiii. p. 647.

Station No.	Date. 1898.	Latitude.	Longitude.	Depth. Fathoms.	Bottom temperature. Degrees Fahr.	
		Hamburg—Cameroons.				
		N.	W.			
4	Aug. 6	60° 42′·0	3° 10′·8	266	42·7	
6	„ 7	60° 40′·0	5° 35′·5	356	—	
7	„ 7	60° 37′·0	5° 42′·0	322	35·3	
8	„ 8	59° 54′·0	8° 7′·0	299	47·2	
10	„ 8	59° 37′·0	8° 50′·0	725	41·8	
11	„ 9	58° 36′·6	11° 33′·0	957	38·7	
17	„ 17	36° 53′·4	14° 13′·0	972	43·9	
18	„ 17	36° 48′·0	14° 10′·1	86	—	? ? Sounding not exact.
18A	„ 17	36° 48′·0	14° 10′·0	290	—	
19	„ 17	36° 41′·2	14° 8′·4	187	—	
20	„ 17	36° 40′·1	14° 8′·0	574	—	No bottom.
21	„ 18	33° 48′·9	14° 21′·5	106	—	Seine bank.
23	„ 18	33° 47′·5	14° 17′·5	527	—	
24	„ 18	33° 47′·0	14° 20′·7	92	—	
29	„ 24	26° 12′·9	14° 53′·4	173	56·9	Off Cape Bojador.
30	„ 24	26° 6′·1	15° 10′·1	191	58·3	
31	„ 24	26° 5′·5	15° 18′·1	267	52·2	
32	„ 25	24° 43′·4	17° 1′·3	1356	38·3	
37	„ 29	16° 14′·1	22° 38′·3	926	38·7	Near Bonavista, C.V.
40	„ 31	12° 38′·3	20° 14′·9	2620	—	
41	Sept. 2	8° 58′·0	16° 27′·9	964	36·4	
45	„ 5	2° 56′·4	11° 40′·5	2729	32·8	
		S.				
48	„ 7	9° 3′·0	8° 29′·5	3114	35·5	
		N.				
53	„ 10	1° 14′·2	2° 10′·0	1941	—	
			E.			
55	„ 12	2° 36′·5	3° 27′·5	1921	36·4	
56	„ 13	3° 10′·0	5° 28′·0	1246	38·0	
58	„ 14	3° 31′·0	7° 25′·0	388	41·6	
		Cameroons—Cape Town.				
63	„ 26	2° 0′·0	8° 4′·3	1364	36·7	
		S.				
67	„ 30	5° 6′·2	9° 58′·6	1660	37·1	
68	Oct. 1	5° 47′·4	11° 30′·8	117	—	Congo.
72	„ 6	7° 46′·8	11° 8′·1	1278	—	
75	„ 10	16° 24′·8	11° 8′·9	1217	—	
83	„ 17	25° 25′·3	6° 12′·4	536	38·0	A submarine bank in mid-ocean, South Atlantic.
84	„ 17	25° 27′·0	6° 8′·2	512	38·3	
85	„ 18	26° 49′·2	5° 54′·0	2756	33·5	
87	„ 20	30° 34′·9	6° 10′·2	2793	34·0	
89	„ 22	31° 21′·1	9° 45′·9	2889	33·7	
90	„ 25	33° 20′·3	15° 58′·2	1751	36·0	
91	„ 25	33° 23′·4	16° 19′·4	1460	—	
92	„ 26	33° 41′·2	18° 0′·3	97	—	Near Cape Town.
		Cape Town—Agulhas Bank—Cape Town.				
		S.	E.			
97	„ 27	35° 2′·0	20° 7′·0	57	56·5	
102	Nov. 1	34° 31′·2	26° 0′·2	1055	39·1	
103	„ 2	35° 10′·5	23° 2′·0	273	46·1	

Station No.	Date. 1898.	Latitude.	Longitude.	Depth. Fathoms.	Bottom temperature. Degrees Fahr.	
		S.	E.			
105	Nov. 3	35° 29′·0	21° 2′·5	56	57·4	
110	„ 4	35° 9′·0	18° 32′·8	308	42·3	
111	„ 4	35° 16′·2	18° 26′·7	829	36·4	
112	„ 4	35° 32′·8	18° 20′·1	1504	36·0	
113	„ 5	34° 33′·3	18° 21′·2	174	44·8	
		CAPE TOWN—BOUVET ISLAND—KERGUELEN. (See *Geographical Journal*, vol. xiii. p. 647.)				
		KERGUELEN—PADANG.				
	1899.	S.	E.			
168	Jan. 5	36° 14′·3	78° 45′·5	1320	35·8	
169	„ 6	34° 13′·6	80° 30′·9	1700	35·1	
170	„ 7	32° 53′·9	83° 1′·6	1940	34·6	
171	„ 8	31° 46′·4	84° 55′·7	1919	34·6	
172	„ 9	30° 6′·7	87° 50′·4	1131	36·4	
173	„ 10	29° 6′·2	89° 39′·0	2059	34·0	
174	„ 11	27° 58′·1	91° 40′·2	2475	34·0	
175	„ 12	26° 3′·6	93° 43′·7	2575	34·2	
176	„ 13	24° 0′·3	95° 7′·7	2933	32·6	
177	„ 14	21° 14′·2	96° 9′·6	2752	34·2	
178	„ 15	18° 17′·6	96° 19′·8	3232	—	
179	„ 16	15° 8′·1	96° 20′·3	3190	34·4	
181	„ 17	12° 6′·8	96° 44′·4	1178	—	Ross island (Cocos) bearing E.S.E. 4 sea miles.
183	„ 19	8° 14′·0	98° 21′·6	2870	—	
184	„ 20	6° 54′·1	99° 27′·5	2670	34·0	
185	„ 21	3° 41′·3	100° 59′·5	336	47·7	
186	„ 21	3° 22′·1	101° 11′·5	494	43·9	
187	„ 22	2° 11′·8	100° 27′·1	914	42·7	Between the Nias islands and the west coast of Sumatra.
		PADANG—COLOMBO.				
		S.	E.			
189	„ 30	0° 57′·5	99° 51′·1	420	45·2	
190	„ 30	0° 58′·2	99° 43′·2	700	42·7	
191	„ 31	0° 39′·2	98° 52′·3	410	44·8	
192	„ 31	0° 43′·2	98° 33′·8	203	51·8	Siberut channel. In the German lists the longitude must be corrected.
		N.				
193	Feb. 1	0° 30′·2	97° 59′·7	72	74·3	
194	„ 1	0° 15′·2	98° 8′·8	336	50·4	
195	„ 1	0° 30′·5	98° 14′·2	325	50·6	Pulo Nias bearing north.
196	„ 1	0° 27′·3	98° 7′·4	353	—	
197	„ 2	0° 23′·0	97° 57′·0	146	—	
198	„ 2	0° 16′·5	98° 7′·5	370	—	
199	„ 2	0° 15′·5	98° 4′·0	257	50·6	
200	„ 3	0° 46′·2	96° 23′·2	2851	34·2	
201	„ 3	1° 13′·7	96° 43′·8	1710	35·5	
202	„ 4	1° 48′·1	97° 6′·0	77	60·8	
203	„ 4	1° 47′·1	96° 58′·7	361	48·4	Bangkaru bearing north.
204	„ 4	1° 52′·3	97° 1′·6	46	80·6	
205	„ 4	1° 48′·9	96° 53′·0	625	43·0	
206	„ 5	2° 12′·3	95° 41′·3	817	40·0	
207	„ 6	5° 23′·2	94° 48′·1	560	—	
208	„ 7	6° 54′·0	93° 28′·8	162	52·6	Great Nicobar bearing N.E.
209	„ 7	6° 56′·3	93° 32′·7	198	50·6	
210	„ 7	6° 53′·1	93° 33′·5	411	46·8	
211	„ 8	7° 48′·8	93° 7′·6	440	44·8	West entrance of Sombrero channel.

Station No.	Date. 1899.	Latitude.	Longitude.	Depth. Fathoms.	Bottom temperature. Degrees Fahr.	
		N.	E.			
212	Feb. 8	7° 49'·1	93° 10'·5	2165	52·0	Kachal bearing N.E.
213	„ 9	7° 57'·9	91° 47'·2	2173	34·2	
214	„ 10	7° 43'·2	88° 44'·9	2019	34·2	
		COLOMBO—CHAGOS ISLANDS—SEYCHELLE ISLANDS—DAR-ES-SALAAM.				
216	Feb. 16	6° 59'·1	79° 31'·7	714	41·0	
217	„ 17	4° 56'·0	78° 15'·3	2436	—	
218	„ 18	2° 29'·9	76° 47'·0	2260	34·6	
		S.				
219	„ 20	0° 2'·3	73° 24'·0	1232	36·2	Equatorial channel.
220	„ 21	1° 57'·0	73° 19'·1	1596	35·3	
221	„ 22	4° 5'·3	73° 24'·8	1600	35·3	
222	„ 22	4° 31'·0	73° 19'·7	1380	35·8	
223	„ 23	6° 19'·3	73° 18'·9	1857	35·1	
225	„ 26	6° 38'·5	70° 58'·1	1163	36·4	
226	„ 27	4° 5'·8	70° 1'·9	2258	34·6	
227	„ 28	2° 56'·6	67° 59'·0	1500	35·6	
228	Mar. 1	2° 38'·7	65° 59'·2	1895	35·3	
229	„ 2	2° 38'·9	63° 37'·9	2515	35·3	
235	„ 9	4° 34'·8	53° 42'·8	1300	35·8	
237	„ 11	4° 45'·0	48° 58'·6	2773	34·2	
240	„ 14	6° 12'·9	41° 17'·3	1618	35·6	
242	„ 20	6° 34'·8	39° 35'·5	221	52·0	
		DAR-ES-SALAAM—ADEN.				
245	„ 22	5° 27'·9	39° 18'·8	253	50·0	Zanzibar channel.
246	„ 22	5° 24'·0	39° 19'·8	447	46·4	Pemba channel.
247	„ 23	3° 38'·8	40° 16'·0	472	45·0	
248	„ 23	3° 17'·3	40° 42'·7	228	52·7	
249	„ 23	3° 7'·0	40° 45'·8	409	47·2	
250	„ 24	1° 47'·8	41° 58'·8	912	38·9	
251	„ 24	1° 40'·6	41° 47'·1	379	48·2	
252	„ 25	0° 24'·5	42° 49'·4	557	—	
253	„ 25	0° 27'·4	42° 47'·3	349	49·3	
254	„ 25	0° 29'·3	42° 47'·6	534	46·4	
		N.				
256	„ 27	1° 49'·0	45° 29'·5	620	45·7	
257	„ 27	1° 48'·2	45° 42'·5	899	40·3	
258	„ 28	2° 58'·5	46° 50'·8	745	42·8	
259	„ 28	2° 58'·8	47° 6'·1	705	43·4	
260	„ 29	4° 33'·5	48° 23'·1	165	59·0	
261	„ 29	4° 36'·1	48° 37'·6	663	44·1	
262	„ 29	4° 40'·8	48° 39'·6	679	43·9	
263	„ 29	4° 41'·9	48° 38'·9	450	—	
264	„ 30	6° 18'·8	49° 32'·5	590	46·8	
265	„ 30	6° 24'·1	49° 31'·6	343	50·0	
266	„ 30	6° 44'·2	49° 43'·8	405	48·6	
268	April 1	9° 6'·1	53° 41'·2	2769	34·2	
270	„ 4	13° 1'·0	47° 10'·9	1006	38·7	Gulf of Aden.
271	„ 4	13° 2'·8	46° 41'·6	803	43·0	Gulf of Aden.

2. DEEP-SEA TEMPERATURES.

The measurements of deep-sea temperature and the chemical analyses of the sea-water were placed in the second rank of importance in the work of the expedition. We employed principally the English deep-sea thermometers of Negretti and Zambra, —first the reversing thermometers, which, after a little alteration, we used with

success in the antarctic water, where they are indeed indispensable; then we used index-thermometers of the double-tube principle. Besides, we had some good Casella instruments. The trials of an electrical thermometer supplied by Siemens Brothers proved extremely interesting. In this instrument the variations with temperature of a platinum spiral are observed by means of a Wheatstone bridge, using the zero method, and hence we have a measure of variations of the deep-sea temperature. We had only 400 fathoms of cable, and, owing to some technical defects, the instrument was not employed to any great extent; however, these defects can be remedied, and then, as far as we have ascertained, the instrument will probably give excellent results. There remains, it is true, an inevitable disadvantage—that is, the size of the cable, which is about half an inch in diameter, and even in a weak current is deflected in uncertain angles, so that without a manometer the true depth of the spiral cannot be ascertained. But amongst the ice, especially near a south polar winter station, wherever small but important differences of temperature in the deep water are to be expected, and there is no current, I should think such an apparatus most valuable.

We have made complete serial temperature observations from surface to bottom at fifty-nine stations; twenty-one series in the northern and southern Indian ocean alone.

As it is impossible here to discuss at length results which are different for the different parts of the oceans, I may be allowed to give only a few series of deep-sea temperatures taken by the *Valdivia* in the various regions and currents.

The observations at the ice-limit are most interesting, as giving a typical polar temperature series. We have from the surface to 50 fathoms very cold water (29° or 30° Fahr.), the water of the melting ice; then follows a layer of warm water (32° to 35° Fahr.), down to about 1000 fathoms; and lastly, towards the bottom, again temperatures under 32° Fahr., but not so cold as the surface layer. Further, we have in the western part of our antarctic voyage, near Bouvet island, somewhat lower temperatures than in the eastern part, in the vicinity of Enderby land, showing that Bouvet island has, in spite of its relatively lower latitude, a pronounced antarctic character, whereas near Enderby land warming influences seem to prevail. The importance of these temperatures is obvious; the existence of a layer of relatively warm water more than 1000 fathoms in thickness is extraordinary, especially if in 60° S. lat. you still find a temperature of 35° Fahr. at a depth of nearly 1000 fathoms. The big icebergs all dip into this layer of temperatures above 32° Fahr., and these facts may also suggest important conclusions in interpreting the results of some of the plankton observations and the catches with the closing nets.

The greater salinity in the warm layer accounts for the fact that this distribution of temperatures (disregarding vertical currents, which would effect a compensation) is stable. The well-known series of temperatures observed by the *Challenger* in the south of Kerguelen towards the ice-limit has not been found by us, perhaps because the *Valdivia* was not far enough to the east, or because we were in the ice at another season (November and December). On the whole there is a resemblance in the temperatures found by the *Challenger* and *Valdivia*, since we have also found a minimum of temperature at a depth of about 50 fathoms, but our surface water was much colder, and our warm layer much warmer, than that of the *Challenger*.

At any rate, it is important, in view of antarctic exploration, to point out that in the longitude of Kerguelen, before Enderby land and close to the pack-ice, we have found higher temperatures of the water than anywhere else on the entire ice-route, higher even than the *Challenger* observed further to the east, and this is one reason why the German antarctic expedition of 1901 will attempt to go south in the longitudes of Kerguelen.

SOME SERIES OF DEEP-SEA TEMPERATURES.

SS. *Valdivia*.

Fathoms.	Station No. 6. Date. Aug. 7, 1898. Lat. 60° 40′ N. Long. 5° 36′ W.	Station No. 135. Date. Dec. 2, 1898. Lat. 56° 30′ S. Long. 14° 29′ E.	Station No. 26. Date. Aug. 19, 1898. Lat. 31° 59′ N. Long. 15° 5′ W.	Station No. 90. Date. Oct. 25, 1898. Lat. 33° 20′ S. Long. 15° 58′ S	Station No. 169. Date. Jan. 5, 1899. Lat. 36° 14′ S. Long. 78° 46′ E.	Station No. 41. Date. Sept. 2, 1898. Lat. 8° 58′ N. Long. 16° 28′ W.	Station No. 221. Date. Feb. 22, 1899. Lat. 4° 5′ S. Long. 75° 25′ E.	Stations No. 73, 74. Date. Oct. 7, 8, 1898. Lat. 10° S. Long. 10° E.	Stations No. 179, 180. Date. Jan. 16, 17, 1899. Lat. *c.* 15° S. Long. *c.* 96° E.	Fathoms.
	North of Wyville Thomson ridge.	Near Bouvet Island.	Near Madeira, North Atlantic.	Benguela current, South Atlantic.	Near New Amsterdam, South Indian Ocean.	Countercurrent (West monsoon).		South equatorial current (south-east trade).		
						Atlantic Ocean.	Indian Ocean.	Atlantic Ocean.	Indian Ocean.	
	Polar region.		Temperate zone.			In the tropics.				
	Degrees Fahrenheit.									
0	49·7	29·3	71·1	61·4	63·5	79·9	81·5	72·4	81·4	0
10	—	29·2	—	—	—	—	—	—	—	10
20	48·8	29·1	70·6	60·5	60·3	65·0	79·7	61·9	80·8	20
30	—	29·1	—	—	—	—	—	—	—	30
40	47·2	29·2	63·9	58·5	57·2	63·0	71·6	58·1	78·7	40
50	—	29·2	—	—	—	—	—	—	—	50
60	46·1	29·6	62·1	56·2	55·3	57·2	68·0	57·6	77·0	60
70	—	31·0	—	—	—	—	—	—	—	70
80	45·7	31·1	60·7	55·3	54·9	55·4	64·1	56·9	75·4	80
90	—	31·5	—	—	—	—	—	—	—	90
100	45·7	32·6	60·1	54·2	54·5	54·2	58·3	55·8	73·3	100
150	45·2	33·0	57·8	51·8	54·2	52·4	52·7	52·7	58·7	150
200	40·9	33·1	56·3	49·0	51·1	50·0	51·3	49·0	52·9	200
300	32·0	33·1	53·8	44·8	51·8	46·6	48·6	43·7	47·7	300
400	—	33·3	51·3	41·9	47·9	42·8	45·9	40·9	45·0	400
500	—	33·4	50·0	39·1	42·7	41·0	44·3	39·8	42·8	500
600	—	33·4	49·7	—	39·6	40·1	41·9	39·4	41·0	600
700	—	32·9	48·6	—	38·2	39·6	40·7	39·2	39·6	700
800	—	32·3	47·9	—	37·8	38·5	39·6	39·1	38·2	800
900	—	32·0	45·4	—	37·4	47·1	38·7	—	37·6	900
1000	—	31·8	42·8	—	37·1	—	37·4	—	37·1	1000
1500	—	31·6	—	—	—	—	35·6	—	35·6	1500
Depth in fathoms	—	2785	—	1751	1320	964	1600	—	3190	Depth in fathoms
Bottom temp.	—	30·9	—	36·0	35·8	36·4	35·3	—	34·4	Bottom temp.

3. Antarctic Ice.

Now I may give a short description of the state of the ice observed by the *Valdivia* in November and December, 1898.

The ice between Bouvet island and Enderby land in those latitudes was observed outside the usual routes for the first time for many years. The extraordinarily strong drift of the ice and icebergs which took place from 1892 to 1897 in the South Atlantic and in the Indian ocean, had just ceased. It is most likely that we met with relatively favourable ice-conditions, because during the last few years an unusual amount had drifted northward. We saw about one hundred and eighty bergs of different sizes; their exact positions were recorded, and their approximate dimensions measured or estimated; a good many icebergs were sketched, a still greater number photographed.

The *Valdivia* remained nearly four weeks in the ice, although she was not built of wood, had only one screw, and was not rigged for sailing.

The first iceberg was sighted shortly before Bouvet island on November 25. We met with the first drift-ice on November 30, the temperature of the water being 29° Fahr. Whenever icebergs occurred, as a rule drift-ice, often in wide irregular fields, appeared; this consisted of pieces of totally crushed ice, all of nearly uniform small height, and often forming a sort of what we call "Eisbrei." The specific gravity of this ice and other things make it probable that it consists in great part of fragments of glaciers—that is to say, of fresh-water ice; once we saw many such fragments falling from an iceberg. This drift-ice was most abundant and compact north-east of Bouvet island; then followed a very remarkable decrease in the number of icebergs, and at intervals the total absence of drift-ice, between 20° and 40° E. long., beyond which both the icebergs and the ice-fields increased again.

The pack-ice, which was easily recognized as sea-water ice by its greenish colour, presented a totally new and peculiar phenomenon, for it rose sometimes level with the deck of the steamer and showed obvious layers, one upon the other. We only met with it near Enderby Land, about 100 sea miles to the north; it of course compelled us to go back.

Regarding the icebergs, it is remarkable that those in the western part of our voyage, near Bouvet island, looked weather-beaten, with grotesque forms, full of clefts and caves. Most frequently there was a low forefoot of ice spread in front of the berg, often occupied by penguins; more rarely the berg had retained its original centre of gravity, and the hollows made by the waves lay exposed. The table-form drawn by the *Challenger* was very rare in the western part of our ice-route; briefly, everything suggested that those icebergs had already made a long voyage, whence it follows, I think—and I am supported by the absence of ice between 20° and 40° E. long., and by the depth of the antarctic ocean—that no land exists between 0° and 40° E. long., except, perhaps, in very high polar latitudes. This has already been shown, to some extent, by the explorations of Ross and Bellinghausen. Between 40° and 62° E. long., where the icebergs increase again, another important fact appears. The further we went to the east, the more we found the remarkably regular tabular icebergs like those drawn in the *Challenger* narrative. Some of them, as before Enderby Land, were to all appearance just broken off the land, and showed no clefts.

The height of the icebergs was measured by the sextant after the distance had been found by the sound of a shot or of the steam-whistle; the average height was between 100 and 180 feet above the water, so that 1200 to 1500 feet of ice dipped below the surface. The longest iceberg, which, however, we saw only at a great distance, was 3 to 4 sea miles long, and fully reproduced the effect of Ross's well-known antarctic ice-barrier.

The *Valdivia* expedition has nowhere in the higher southern latitude met with

drifting seaweed, whereas in the accounts of Cook and Ross this weed is said to be abundant; however, the great depths and the want of land-masses made it most unlikely that we should meet with it.

4. Various Observations.

As to other oceanographical observations, determinations of specific gravity and salinity of the sea-water were made twice daily, besides frequent observations of the transparency and colour of the water; the results of all these can only be made intelligible with the help of charts. There remain experiments with drifters: direct current observations were very difficult on the *Valdivia*, because during the fishing the engines were seldom completely at rest.

I am sorry I cannot now say anything about the distribution of the deep-sea deposits, as our physician and bacteriologist, Dr. Bachmann, who had taken up this part of the work, died, and after his death the specimens of the deposits were packed away, and have not yet been even superficially examined. On the whole, however, our results agree with those already known. Special attention has been paid to the existence of diatom earth within the region of the antarctic ocean from Bouvet island up to near Kerguelen.

5. Meteorology.

The meteorological equipment had been supplied from the "Seewarte" at Hamburg. A meteorological journal was kept, the observations being registered every four hours day and night by the officer on the bridge. Besides these important observations, we had three registering instruments, a thermograph, a hygrograph, and a barograph (by Richard frères), which showed themselves very correct during the entire voyage. Thus for every hour of our way we shall be enabled to give the most important climatic elements. A hygrograph, especially in the high southern latitude, is, perhaps, a new thing at sea.

The variations of the barometer in the squalls of the tropics, at the change of the winds, etc., have been observed, and some observations of insolation and radiation have been made, besides measurements of the amount of rainfall, etc.

I will here describe only the state of the weather near the ice-limit, as we know it for a relatively large distance from 0° to 60° E. long. Here the limit between the stormy region of the "brave west winds" and the light east winds south of about 55°–57° S. lat. has a particular interest.

When we left Cape Town in November, on a south-south-west course, we had variable and often stormy weather, frequently a heavy sea, and sometimes heavy storms from the west-north-west. Not later than near Bouvet island we got temperatures of the water of 30° Fahr. and of the air under 32° Fahr.—that is to say, in the southern summer and in a latitude like the northern part of England. Add thereto a continuous storm from north-west or west-north-west, and you may see that it was terrible weather; the deck was frozen or covered with slush and ice. When going along close to the ice during the next three weeks we got continually an air-temperature under 32° Fahr.; the minimum was only 27°·5 Fahr., but this was sufficient to produce some disadvantages. The pumps, the fresh-water tanks, the steam-pipes which supplied one of the sounding-machines, were frozen, and sometimes the ship was totally covered with snow as in the hardest winter.

As to the details, we got the west winds up to about 20° E. long., in 55½° S. lat. On December 4 we seemed to lose the stormy west winds and to reach their polar side, for the character of the weather for the entire distance from 20° to 60° E. long. to 65° S. lat. was totally altered. We had light winds,

mostly from the east, of force 1–3 of Beaufort's scale at most, with calms and often perfectly smooth sea, not even a ripple, on December 5, 6, 7, 8, 10, 11, 12, 14, 15, 17, 21; that is, on 70 per cent. of the seventeen days we spent south of 55° lat. On the remaining 30 per cent. of those days we had moderate to strong winds, but also from the east, north-east, and north, and even storm from the east; at any rate, no sign of west winds during all these weeks.

This weather by itself was favourable for our work, but the frequent fog and overcast grey sky prevented us sometimes, on the other hand, from going on. As soon as we had passed 55° S. lat. on our way northward, this time to the east, in the longitude of Kerguelen, we again met with the stormy west winds, and westerly storms accompanied us up to Kerguelen. There remains still one remarkable thing, that is, the change of the barometer. You might expect that, beyond the stormy west winds, that is, south to about 55° lat., in the light east winds and good weather the barometer rose again, and that we had a relatively high pressure of the air. To my surprise, we got the following results from the registering instrument:—

Within the west-wind region, mean, 29″·51; and in their western part (Bouvet), 29″·63; and in their eastern part (Kerguelen), 29″·40.

Within the east-wind region, mean, 29″·32.

The most southerly regions had the lowest average of atmospheric pressure; we have not yet found a rising of the barometer towards the pole or a trace of an antarctic anti-cyclone, even not near Enderby land.

NOTES ON A MAP OF PART OF THE CORDILLERA REAL OF BOLIVIA.*

By Sir MARTIN CONWAY.

The part of the Cordillera Real contained in this map includes the highest portion of the range. The mountains and the whole south-west slope for a width of about 25 miles were surveyed by me in 1898, and had not been previously surveyed. The approach of the rainy season prevented me from making a close inspection of the somewhat tangled ridges between the Chisel peak and Condoriri, where some errors may have crept into the map. I did not visit the north-east side of the range. My own work is based upon a careful triangulation, the net of which is deposited for reference in the Royal Geographical Society. Details were filled in by means of a plane-table sketch, but the small scale upon which my work is here reproduced prevents the smaller forms from being reproduced. This is unfortunate, because the details of mountain form are in many respects even more important, from an orographical point of view, than the general configuration of the country, which they would explain and account for. My original large-scale drawing, however, is in the Society's collection and can be referred to. The nomenclature of the peaks is very imperfect. All the mountains, I believe, have native names. Being ignorant of the Aymara language, I was unable to find them out, and none of the educated Bolivians I met could tell me what they were. The only names, of peaks along the main chain, of which I am certain are Illampu, Ancohuma (Hankuma), Condoriri (or Murumamani), Caca-aca, Mururata, Illimani, and Laicacollo. Chachacomane exists in the neighbourhood where the name is written, but may be the next peak to north or south. The other names are very doubtful.

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* Map, p. 564.

The remainder of the map is from various unpublished surveys by different individuals, which were given to me in Bolivia. I have deposited the original documents in the Society's collection. The Pauchinto, Coriaguira, and Tipuani valleys are from an excellent survey by Mr. J. B. Minchin, made in 1880. The Amaguaya and Challana valleys are from a map by Señor Ed. Idiaquez, made to represent the line of a projected road from La Paz to Huanay. The Zongo and Coroico valleys were surveyed by Señor Deodoro Moegle. The Rio de la Paz from below Las Juntas and the Rio Beni are from Heath's survey. The route from La Paz to the Rio Undavi is from a very rough sketch-map by R. R. Harris, to indicate the route of a proposed railway to Yungas. A line of route from Desaguadero to La Paz is from a most accurate survey by Señor Bustamante. Some details of the Puna south of Quenco are from Mr. Minchin. Finally, the outline of Lake Titicaca, beyond the parts I touched, is borrowed either from Herr Stübel's map in *Petermanns Mitteilungen*, or from Mr. Minchin. I have not reproduced any portion of Pentland's map. I have adopted for the altitudes of the peaks on the main range the means of my own and the best other observations I could find. I have not taken in account such measurements as give to Sorata and Illimani heights of 25,000 feet, whereof several might be quoted. The following are the observations from which the means have been deduced:—

Name of peak.	Authority.	Altitude.	Mean altitude.
		Feet.	Feet.
North outlier of Illampu ...	Conway	17,237	17,237
Illampu (Mount Sorata) ...	—	—	21,275
	Conway	187 feet below Ancohuma	—
	Pentland	243 " "	—
Ancohuma (Mount Sorata) ...	—	—	21,490
	Pentland	21,286	—
	Minchin	21,470	—
	Conway	21,710	—
Haukaña peak (Mount Sorata)	Conway	20,518	20,518
Corpapato (?)	Conway	19,697	19,697
Chachacomane	—	—	20,590
	Pentland	20,355	—
	Conway	20,822	—
Chisel peak	—	—	20,100
	Pentland	20,115	—
	Conway	20,090	—
Condoriri	—	—	20,030
	Reck	20,115	—
	Conway	19,943	—
Caca-aca	—	—	20,320
	Pentland	20,260	—
	Reck	20,292	—
	Minchin	20,170	—
	Conway	20,560	—
Mururata	Conway	18,980	18,980
Illimani	—	—	21,190
	Pentland	21,181	—
	Pissis	21,355	—
	Reiss	21,040	—
	Minchin	21,224	—
	Reck	21,339	—
	Conway	21,015	—
Quimza Cruz	—	—	18,280
	Reck	18,363	—
	Moegle	18,195	—

THE MONTHLY RECORD.

EUROPE.

Glacial Erosion at Loch Lochy.—At a recent meeting of the Geological Society, Dr. W. T. Blanford directed attention to a form of surface, apparently the result of glacial, with subsequent fresh-water, erosion, of which a particularly striking instance occurs on the side of the great glen of Scotland near the head of Loch Lochy (*Quarterly Journal Geol. Soc.*, February, 1900). At that point, and especially on the south-east side of the glen, the glaciated slope is singularly regular, inclined at an angle of about 35°, and presents the appearance of having been planed by glacier action to a greater extent than is usual. The streams that drain the slope have cut numerous channels, not more than 10 or 15 feet deep on the average, though in exceptional cases they may reach a depth of 50 feet. The crests of the hills, which rise to a height of 2000 feet above the sea, are intersected by glens 500 feet deep, or even more, the lower parts of which are clearly truncated by the sloping plane above alluded to. The surface of this is formed by a narrow band of Devonian strata, composed at the spot in question of a hard but easily disintegrated sandstone, to the lithological character of which Dr. Blanford suggests both the even slope and the extent of furrowing by watercourses may be due. Dr. Blanford regards the features described as especially worthy of attention, firstly as supplying an instance of extensive erosion by a glacier, and secondly as affording a possible means of estimating the approximate date of the termination of the glacial epoch. For the latter object careful observations of the present rate of deepening of the ravines would be necessary, and as this may only amount to about 6 inches in a century, a certain number of years must elapse before any definite results could be attained. Dr. Blanford is inclined to minimize the amount of post-glacial erosion by which the whole slope has been affected, but the possibility does not seem excluded that the lithological character of the rock may have favoured the removal, under the action of frost, of the surface layers at a rate which would keep pace, to a certain extent, with the deepening of the channels. Again, might it not be possible that the present ravines may be of recent origin, due in the first instance to exceptional downpours of rain, such as opened out a new gully on the side of Helvellyn in a single night in the autumn of 1898?

Lakes of the Snowdon District.—Mr. J. R. Dakyns gives in the *Geological Magazine* (February, 1900) some account of his investigations of the lakes and tarns of Snowdon, with especial reference to their mode of origin. Mr. Dakyns has so far been unable to make a full examination of the lakes and their surroundings, but his observations of level by means of an aneroid lead him to dissent from the opinions expressed by Messrs. Marr and Adie in their paper on the lakes of Snowdon, and to regard all the lakes examined as true rock basins. For the settlement of the question soundings are of course necessary, and the hope is expressed that such may be executed during the coming summer, possibly by the writer himself. In the case of Glaslyn, Mr. Dakyns says that solid rock extends entirely across the outlet on a line the lowest point of which is no more than 40 feet below the level of the lake, and is seen in the bed of the stream at less than 6 feet below that level. The present stream, which Messrs. Marr and Adie show to be above the bottom of the drift-filled depression, is, he says, an artificial watercourse. Again, in all possible outlets to Llydaw solid rock is reached no lower than 40 to 50 feet below the lake-surface, while evidence exists that the depth of the lake is very much greater. In the case of the other tarns and lakes, Mr. Dakyns holds that the estimates of the thickness of drift made by Messrs. Marr and Adie are unsupported by facts, while as regards the surroundings of Llyn Quellyn, he says that statements of those writers are incorrect.

Agriculture in Kent.—The *Journal of the Royal Agricultural Society* contains a "Sketch of the Agriculture of Kent," by Mr. Charles Whitehead, which contains much information of geographical interest. Mr. Whitehead divides the county into four divisions—East Kent, Mid-Kent, North Kent, and the Weald of Kent; and four subdivisions—Romney Marsh, the Isle of Thanet, the Isle of Sheppey, and the Hundred of Hoo. A good summary of the geology of each division is given, and the soil and agriculture are brought into relation with the different geological formations. The study of this aspect of the subject is particularly interesting as an illustration of the manner in which the effect of such natural factors are modified by artificial conditions imposed from without, *e.g.* the dominating influence of London as a market for fruit and dairy produce, and as a centre of attraction, making it almost impossible to obtain agricultural labour at a reasonable cost. Besides the geology, Mr. Whitehead discusses the influence of surface relief in different parts of the county, but the importance of this element is hardly sufficiently emphasized, and it is a great pity that no attempt has been made to discuss the climatology of Kent. Besides mean values of temperature and rainfall, given for the whole county, we have merely a few general remarks, just sufficient to show how valuable a review of agriculture from this point of view would have been, but little more. Mr. Whitehead's conclusions are very significant. "There is probably no county in the kingdom in which there are so many kinds of crops and industries in connection with the cultivation of land. . . . Some of them may be classified as minor industries . . . but they are of the greatest importance to Kentish cultivators, without which they would have been in an almost hopeless state of depression. These 'minor industries' . . . will be further developed as the wealth of the country and the prosperity of all classes increase, and many of the Kent cultivators are availing themselves skilfully and energetically of the opportunities which their soil, climate, and traditions offer."

The Railways of Hungary.—At the end of 1897 the total length of the Hungarian railways amounted to 15,752 kilometres (9766 miles), of which total about 13,000 kilometres (8060 miles) were under State control, and only some 2800 kilometres (1736 miles), chiefly local lines, under that of private companies. The rapid extension of the railway system has brought with it, as a direct result, a development of Hungarian industry, inasmuch as the greater part of the railway material is now produced in Hungary—at the works at Budapest, Diósgyör (at the southern foot of the Hungarian Erzgebirge, between Waitzen and Tokaj), and Reschitza (in the Banat). In a country so rich in natural products as Hungary, where the carriage of corn gives rise to an extraordinarily brisk traffic for several months together, and goods are mainly despatched in bulk, a very large rolling-stock is indispensable. Thus the number of goods waggons reached some 50,000 in 1896, representing a total cost of 90 milliards of florins, while the passenger carriages had only involved an outlay of 34 milliards. The following table shows the number of ton-kilometres representing goods forwarded, at intervals of ten years:—

1877	...	1,300,800,000 = 192,000	per kilometre open.
1887	...	2,420,900,000 = 249,000	" "
1897	...	4,772,200,000 = 314,000	" "

The number of ton-kilometres has thus nearly quadrupled within two decades, and has nearly doubled even in proportion to the total length of railway open for traffic.

Races of Europe.*—The necessity of taking into consideration the physical features of a district when dealing, not only with the migrations of people, but

* 'Races of Europe: a Sociological Study.' By William Z. Ripley, PH.D. London: Kegan Paul, Trench, Trubner, & Co. 1900.

with the evolution and social condition, is being increasingly recognized, and it constitutes the keynote of the memorable work on the races of Europe which Dr. W. Z. Ripley has recently offered to his fellow-workers. Before dealing with the inhabitants of a country, Dr. Ripley's first care is to give a brief sketch of its salient physical features, often accompanied by a map, and all through the book he keeps, so to speak, one eye on the geographical features of the area in question. To take a chance example, in describing the detailed map of the distribution of cephalic index in Liguria, he says, "It is curious to note how the sharpness of the ethnic boundary is softened where the physical barriers against intercourse between north and south are modified. Thus north of Genoa there is a decided break in the distinct racial frontier of the province; for just here is, as one topographical map of the country indicates, a broad opening in the mountains leading over to the north. The pass is easily traversed by rail to-day. Over it many invasions in either direction have served to confound the population upon either side." Dr. Ripley discusses in various places the problem of the direct or indirect effect of environment on certain physical characteristics. The very general observation that mountaineers are shorter than people living in plains is probably mainly a question of food; but even the fact is not universal. In Thuringia, for example, the proportionately higher stature of the mountaineers is due to the later occupation of the valleys by the relatively short Slav invaders from the east. "In addition to the direct effect of environment, a selective process is also at work. Only thus can we account for the fact that, while the populations at moderate altitudes seem to be physically depressed by their surroundings, those from regions of the greatest elevation seem to be rather above the normal stature. It seems permissible to assume with Ranke that only those of decided vigour are able to withstand the rigours and privations in this latter case, leaving an abnormally tall, selected population as a result." Wherever the geology of a district has produced a poor soil, or where the climate is unfavourable to prosperity, the influence is reflected on the physical characteristics of the people. All over Europe may be found these "misery spots," where the environment acts directly upon stature through poor food-supply and unfavourable social conditions; but physical degeneration is not the only effect of these "black areas." The chapters on environment *versus* race, acclimatization, and urban selection, or that tendency towards long-headedness, shortness of stature, and brunetness that characterizes most large towns, are of especial interest to the sociologist who endeavours to trace the effects of climate, soil, food-supply, the density of the population, and other more or less physical factors, on the bodily, social, and moral characteristics of human societies. Dr. Ripley clearly exposes the weakness of that crude conception which exalts the influence of race as opposed to other data which is the favourite doctrine of certain enthusiastic temperaments and patriotic societies. Dr. Ripley recognizes three European races: the tall, fair dolichocephals (long-heads), northern, or Teutonic race, as he prefers to call it; the short dark brachycephals (round-heads), Alpine race; and the shortish, dark dolichocephals, Mediterranean race. The different peoples of Europe are believed to be the result of more or less mixture of these races, modified by local conditions and sometimes intensified by artificial selection. The author has had to deal with a very intricate series of problems, and he has produced a fascinating work, which, though crammed with facts, is eminently readable owing to an easy style, clear arrangement, and a lavish supply of distributed maps. The reader's interest in the subject is further increased by the 222 portraits of well-chosen national types. A unique feature of the book is the selected bibliography of nearly two thousand works and papers on the anthropology and ethnology of Europe. It is difficult to speak too highly of

the work. Dr. Ripley has taken an infinitude of trouble, not only in collecting his material, but in the manner of its presentation—a matter of no small importance to his readers.

ASIA.

M. Saint-Yves' Journey to Kashgar and the Pamirs.—The second number of *La Géographie* contains the account by M. G. Saint-Yves of his journey to Chinese Turkestan and the Pamirs undertaken during the latter half of 1899. The route followed was in great part over known ground, unforeseen difficulties having curtailed the programme, but in one or two localities the beaten track was left and some new geographical results obtained. The alteration of plans prevented the attainment of great results as regards the historical geography of the country, which had been the primary object of the expedition. From Andijan, the terminus of the Trans-Caspian Railway, M. Saint-Yves proceeded by Osh to Gulcha, examining the ruins, which date from the time of the independent Khans of Khokand. At Gulcha the Russian military road to the Pamirs commences, from which the route to Kashgar diverges at Suffi Kurgan. It was followed, however, some distance further, as the traveller wished to investigate the passes of the Alai west of the Terek davan. He succeeded in discovering three new passes, all high and difficult, and also found that the principal stream on the south side of the mountains is not the Terek-su, as is shown on Russian maps, but the Suguat-su, of which the former is an affluent. There is also a Suguat-su on the north side of the Alai, as the Kirghiz adopt the confusing practice of calling all streams which descend from the same crest by the same name. At Irkishtam, the Russo-Chinese frontier post, M. Saint-Yves again diverged from the usual route with a view to exploring the little-known Maltabar range, belonging to the system of the Mustag-tau. In crossing this range a series of snow-peaks and glaciers was seen to the west, rising in the pyramidal Dutreuil de Rhins peak to a height of some 18,000 feet. Between this chain and that of the Kovan-tau to the south runs the fine valley of the Kovan, a hitherto undescribed tributary of the Kizil-su, or Kashgar river, to which its course was followed. The Kovan-tau also contains a series of snow-peaks, varying from 15,000 to almost 20,000 feet in height. An attempt to explore the Kizil-su down to its confluence with the Markan-su failed, and the ordinary route to Kashgar was rejoined. From Kashgar M. Saint-Yves proceeded south by the valley of the Kenkol river and the Chichiklik pass, and, after searching in vain for a new pass across the snowy chain which bounds the Pamirs on the east, reached the Aksu by a northerly *détour*. On the return journey from the great Pamir to Margilan, M. Saint-Yves avoided the Taldik pass, crossing the Alai further west by that of Jiptik. It afforded a marvellous panorama of the Trans-Alai, and on the north led to the Khoja Balan-su, which flows for 30 miles through frightful gorges.

AFRICA.

Exploration South of Abyssinia.—An English expedition under Messrs. Harrison and Whitehouse has proceeded southwards from Abyssinia in the direction of Lake Rudolf. The latest news, forwarded by Reuter's agency, states that the party had reached Zuquala, on the Hawash, and was about to proceed to the Walamo country by the chain of lakes running southward through the Galla lands. Camels are being employed for transport purposes. From Lake Rudolf the Expedition will strike westward for Nasser, on the Sobat. A complete survey of the route will be made. The ruins of an old city had been discovered on a hill, well and closely built, with narrow streets extending for three-quarters of a mile. It seems possible that this was one of the "ambas" or inhabited mountains mentioned by the old travellers.

Exploration in French West Africa.—The arrival in the French Sudan of the Hostains-d'Ollone mission, which set out last year to explore the region of the upper Kavalli from the south, was announced early in April. After passing out of the basin of the Kavalli, the expedition is said to have come upon a hitherto unvisited tribe of cannibals, who, however, in other respects showed a considerable amount of civilization. Their language differs entirely from that of their neighbours. The expedition was treacherously dealt with, and with difficulty escaped in safety.

Northern Nyasaland.—An instructive sketch of the physical geography of the country west of Northern Nyasa—perhaps, generally, the least-known part of the British Protectorate—is given in the *Scottish Geographical Magazine* (February, 1900) by the Rev. James Henderson, who between 1895 and 1899 made several journeys through the country. Mr. Henderson divides the tract in question into three belts, viz. the coast with its fringing plains, the first or "Tumbuka" plateau, and the second or "Nyika" plateau. The coast plains are reduced to a minimum along the greater part of the northern half of the lake, the mountains going sheer down to the water in many places. The soil, except where alluvial, is generally poor. The baobab, and still more the acacia, is the prevailing tree. Cattle have lately been introduced into most of the villages, the tsetse fly having disappeared with the destruction of the buffalo by rinderpest. Game is not abundant. West of the plains a succession of foothills, slopes, and cliffs, covered with second-growth forest of long standing and producing some useful timber, leads to the Tumbuka plateau, about 2000 feet above lake-level. It terminates northwards in Mount Waller, while southwards it declines on the west to the foot of a still higher escarpment. Its southern extension, however, known as the Vipsya plateau, dies away into the plains. In the north the surface consists of rolling selvas, well watered, and fairly fertile, with peaks bearing dwindling tufts of primeval forest. Wheat and European fruit-trees and vegetables have been grown with some success, and coffee is promising. Mlanji cedar and mahogany have been introduced and thrive well. The whole of this plateau seems free from tsetse-fly. The escarpment to the west is that of the Nyika ("uplands"), which on this side has all the appearance of a mountain range with lofty summits. Contrary to the general idea, this has a very definite outline to the west, its edge rising like a wall of rock before the traveller as he approaches it from the Loangwa valley. From Mount Waller northwards it has its base in the plains of the lake-shore. Along the upper half of the eastern face a girdle of primeval forest of exceeding density extends to a varying depth, but its extent is yearly diminished by the grass fires. The surface of the Nyika is exceedingly rugged; apart from patches of scrub in the hollows, it is grass-clad, the icy winds that sweep over it from west and east after sundown being apparently too severe for trees. At its highest, it is over 7000 feet above sea-level, and is frequently shrouded in mist; while perennial streams, clear, cold, and rapid, intersect it in all directions, giving rise to three important rivers. The whole district described is, as a rule, very thinly inhabited.

The Belgian Katanga Expedition.—News of the expedition to Katanga under the command of Lieut. Lemaire, which set out in 1898 *viâ* the east coast, and of which brief reports have been received from time to time from Tanganyika and the south-eastern parts of the Congo State, was received in Brussels at the end of March, bringing our knowledge of its movements down to November last. Valuable work appears to have been accomplished along the southern frontier of the Congo State, as well as further north. In July, 1899, the expedition was on the Lualaba, but was about to start west for Lake Dilolo. This journey has since been successfully accomplished, the Kasai having been struck and ascended to Lake Dilolo, whence the return journey was made along the Congo-Zambezi water-parting,

the sources of the Lulua, Kiloshi Zambezi, Lubudi, Lufupa, Lunga, and Kabompo being visited. Of these the Lubudi is the great western branch of the Lualaba, considered by M. Wauters as the true head-stream of the Congo. It is probably the Luburi or Lububuri of the "Pombeiros," though the last-named writer is inclined to believe that there are two distinct rivers. The Kabompo is, of course, a tributary of the upper Zambezi, while the Lunga has been considered a branch of the Kafukwe. At the time of writing Lieut. Lemaire was at Tenke, on the upper Lufira, *en route* for Lofoi. A careful survey of the route had been made, and positions accurately fixed. Near the Lualaba the expedition had been joined by Major Gibbons, then on his way to Tanganyika and the Nile.

Progress of British South Africa.—The report of the Directors of the British South Africa Company, issued in December last, contains some interesting information on the general state of the country down to the end of 1899, showing that before the outbreak of the present war satisfactory progress was being made towards the development of the territory. The boundary of Southern Rhodesia—now divided into the two provinces of Mashonaland and Matebeleland—with Portuguese East Africa, had been delimited in Manica as far as the Mazoe, where a cessation of work was necessary pending the adjustment of a difference of opinion with the Portuguese representative. The success of the administration as regards the native population was shown by the very extensive immigration into Rhodesia from neighbouring territories. The telegraph system is being rapidly extended, and in addition to the trunk lines from the Cape and from Beira to Salisbury, and from Umtali to Nyasa and Tanganyika, several branch lines are open or constructing, including a loop *viâ* Tuli from Palapye to Salisbury. A branch line 123 miles long is being constructed from Domira bay, Lake Nyasa, to Fort Jameson. New townships have been established at Rusapi, on the Mashonaland railway, and at Gwanda. A marked improvement in the farming industry is recorded, and a heavy harvest was obtained in Matebeleland in 1899. The inoculation for rinderpest has proved very effective, and it is hoped that the disease has been stamped out. The tsetse-fly is also said to be disappearing in districts in which it was formerly prevalent. As a step towards the proposed northern extension of the railway, the construction of a line from Bulawayo to Gwelo (150 miles) has been taken in hand, and the preliminaries have been arranged for the further extension to Lake Tanganyika. A branch line from Bulawayo to Gwanda has also been decided on. The mining outlook is said to be very favourable. Coal of exceptionally good quality and of considerable thickness has been discovered in the Wankie district 160 miles from Bulawayo. It extends over a wide area, and is said to be equal if not superior to any in South Africa. Deposits of rich copper ore have also been reported in the central districts of Northern Rhodesia, a little north of the Zambezi. The report is accompanied by an appendix giving the terms of the supplemental charter of the company, to which, however, no date is assigned.

Journey in Southern Madagascar. — An interesting journey (briefly described in *La Géographie*, No. 2) was made last year by M. Bastard in the territory of the Mahafali, one of the few tribes of Madagascar previously untouched by French influence. Living in the extreme south-west of the island, the Mahafali and Antandroi have kept aloof from their neighbours, and, though visited by Robert Drury and others during the eighteenth century, have remained off the track of modern travellers. Landing at Tulear, north of the Onilahi river, M. Bastard first visited the Antanosi, entering meanwhile into negotiations with the Mahafali king, from whom he at last obtained permission to visit his kingdom. The Mahafali country is traversed from north-east to south-west by the Ilinta, a stream of which only the mouth in the bay of Masikoro was previously known.

The fauna and flora of its banks seemed to be rich, and the prevailing idea that this region was arid and barren, like the coast, is proved to be incorrect. The country—at least in the north—is well watered and cultivated, and supports a numerous population. M. Bastard considers the people allied to the Bara, who dwell to the north and east. Further west the population is mixed, Arab types being seen side by side with nearly pure Negroes.

The Madagascar Railway.—In the course of a sketch of the recent French activity in Madagascar, contributed to the first two numbers of *La Géographie*, General Gallieni describes the progress which has been made so far towards improving the means of communication, and outlines the project for the Tananarivo railway, the credits for which were recently voted by the French Chamber. The principal road under construction is that from the capital to the coast at Andevorante, whence communication with Tamatave is afforded both by the shore road and by the line of lagoons which fringes the coast. Two considerable sections of this road, which will be macadamized to a width of 3 metres, are almost complete, and the only part not yet touched is that between the Mangoro and Beforona (45 miles). A northern road from Tananarivo to Mevetanana, the head of navigation from Majunga, was also commenced in 1897. The route fixed for the railway between Tamatave and the capital, as the outcome of the surveys of 1897 and 1898, runs first south-west, more or less parallel with the coast, to Aniverano. It thence ascends the valley of the Vohitra and its tributary the Sahantandra, this section being particularly difficult owing to the broken nature of the ground and the sinuosities of the river. The col of Tangaina in the Betsimisaraka range is traversed by a tunnel, after which a *détour* to the north will be made to cross the Mangoro at Fenotsara. West of this a difficult country is again entered, in which the exceptional limiting gradient of 35 in 1000 (1 in 28·6) has been adopted. The article is accompanied by a sketch-map showing the routes of the east coast road and railway, as well as certain possible variants of the latter. General Gallieni's conclusions as to the prospects of Madagascar are distinctly hopeful.

AMERICA.

The Ascent of Mount St. Elias.*—The story of the ascent—even though for the first time—of a single mountain peak might seem at first sight hardly to call for the publication of a sumptuous volume such as has just appeared from the pen of Dr. de Filippi, one of the companions of the Duke of the Abruzzi in his ascent of Mount St. Elias in 1897. But a closer inspection shows that the theme is fully worthy of the style in which the work is produced. To begin with, this possesses the great advantage of being illustrated by the photographs of Signor V. Sella—veritable works of art, like former specimens of his handiwork; and in the next place, the grandeur of the Alpine region in question, which those illustrations enable the reader to fully realize perhaps for the first time, is such as to justify all the attention thus called to it. The prominent position of the mountain as seen from the sea, and the fact that the whole system of glaciers which descend from its neighbourhood unite in a single field of ice before reaching the coast, perhaps tend to mask the extent of the range of which St. Elias merely forms one of the culminating summits; while the vast scale on which nature is moulded in this region is shown by the extent of ice-slopes—60 miles in all—traversed by the duke's party during the ascent. Like Prof. Russell in his two attempts of 1890 and 1891, the Italian travellers made their final attack on the summit by way

* Dottore Filippo de Filippi, 'La Spedizione di S.A.R. il Duca degli Abruzzi al Monte Sant' Elia.' Milan: Hoepli. 1900.

of the Newton glacier, which descends between the two main easterly spurs of the mountain, but the earlier section of the route differed from either of those chosen by the American professor. A landing was effected near the western extremity of Yakutat bay, whence the great Malaspina glacier (here 25 miles wide) was crossed in a nearly north direction to the lower end of the Seward glacier. This latter, which, coming from the vicinity of Mount Logan north of the St. Elias chain, forms the largest feeder of the Malaspina glacier, was ascended for a short distance, after which the parallel Agassiz glacier was reached by the Dome pass across an intervening ridge. The Newton glacier (which runs at right angles into that of Agassiz) led the party to the Russell col, which had formed almost the furthest point reached by the duke's predecessor. Thence to the final summit was a distance of less than 2 miles. Among the many striking views which display the great mountain and its glaciers in the most varied aspects, it is difficult to single out any as specially worthy of mention. One of the most impressive is perhaps an evening view from the Seward glacier, while those of the *seracs* of the Newton glacier and of the dispersion of the mists from the summit as seen from the same valley are also particularly fine. The views of Mounts Cook and Augusta from the Seward glacier show that these peaks almost rival St. Elias itself in massive grandeur. A comprehension of the geography of the range is much facilitated by the panoramas given at the end. One of these, looking north from the crest of St. Elias, is of special interest as affording a glimpse into the icy *terra incognita* whence rises the still higher summit of Mount Logan; a more impressive picture of wildness and desolation it would be difficult to imagine. Finally, the illustrations of plant-life during the brief flowering season, and of the forest-clad shores of Yakutat bay, afford a striking contrast to the world of ice to which they approach so nearly.

The Valley of the Urubamba, Peru.—A recent number of the *Boletin* of the Lima Geographical Society contains the report of a paper on the valley of the Urubamba and its commercial possibilities read last year before the Society by Señor Luis Robledo. After pointing out the great importance of the Urubamba valley as a natural line of communication between the populous and productive plateaux and elevated valleys of the Andes and the wooded Trans-andine plains, and between Lake Titicaca at the extreme south of the Republic and the Amazonian ports of the northern borders, the writer gives a detailed sketch of the commercial resources of the valley in its upper, middle, and lower course. The upper Urubamba valley, with the neighbouring Andine plateaux, embraces some of the most productive districts of Peru, its natural resources including the wool, silver, lead, and mercury of the higher zone, the commerce of which converges by railway and road on Cuzco; the cereals of Acomayo and Paruro; the cattle, gold, and other minerals of Quispicanchi and Paucartambo; and the varied agricultural productions of the temperate region below Cuzco. The middle Urubamba, as defined by Señor Robledo, begins with the passage of the river through the Cordillera by a cañon offering the finest scenery of the Andes of Cuzco, and ends at the famous Pongo de Mainique. During the intervening stretch the river takes a zigzag course with many rapids, while the Torontoy road follows its rocky banks. In the valley of Santa Ana, which extends to the confluence of the Yanatili, much of the tropical forest has been cleared for the plantations of cacao, coca, and sugar-cane which have been established. The populated part of the valley ceases at the Yanatili. The lower Urubamba is navigable from Puerto Samanez, a little below the Pongo de Mainique, traversing the forest-clad plains of the Amazon basin, and receiving many tributaries navigable for canoes. The forests abound in caoutchouc. The great need of the country is the opening of communication by road or railway with the south, and the establishment of such communication is

put forward as the most important task awaiting the enterprise of the Peruvians. A small beginning has been made by the "Sociedad Sihuaniro," which has undertaken the opening of a route to connect the valleys of Santa Ana and Yanatili with Puerto Samanez. This, the writer holds, is bound from its position to become the nucleus of an energetic commercial population.

Geography of the Puna of Atacama.—A sketch of the physical features of the Puna of Atacama—the portion of the Andine region in which the disputed Chilean-Argentine boundary was fixed last year by the United States minister in Argentina—is contributed to the *Zeitschrift* of the Berlin Geographical Society (1899, pt. 4) by L. Darapsky, the results of whose surveys in the south-west of that region are embodied in a large scale map which accompanies the paper. This part of the Puna was not explored by Bertrand, while it was imperfectly surveyed even by the Chilean "Comision Exploradora" under San Roman, and Herr Darapsky found many of the current ideas as to its geography incorrect. Puna in its widest sense signifies a barren upland region; while the Puna in question, lying on the border region of Bolivia, Chile, and Argentina, is characterized by the absence of drainage to the sea and by the great number of salt basins, dry or partially filled with water, which run in a general direction from north to south. It presents striking analogies with the "Great Basin" in North America. Former accounts filled the region with lines of mountain chains, but closer investigation proves that these are both fewer and less extensive than had been supposed. The idea of Philippi that we have to do with a level plain from which isolated summits rise, is also incorrect, for, though steep slopes are rare, the general contours of the country show much variation. With regard to the Cordillera Domeyko, supposed by San Roman to run continuously from the Copiapo volcano, past the peaks of Maricunga, Doña Ines, Bolson, Sapos, etc, to 23° 9′ S., Herr Darapsky says that the cone of Doña Ines has no continuation to the south, in which direction it falls abruptly to the "salar" of Pedernales. Northwards, however, a continuous range undoubtedly extends to 24° 49′ S., and perhaps further. This is the range often known as the Western Cordillera, which forms the physiographical limit of the "Puna," dividing the region of river valleys to the west from that of isolated salt-basins to the east. In the central region, where some former observers have drawn the main chain or "Cordillera Real de los Andes" through a line of great volcanoes, the writer saw no trace of a continuous range. The country forms a *massif* measuring some 45 miles by 16, and the volcano of Lastarria lies off the culminating line of the plateau. Further south, a single ridge is seen, ending in the double volcano of Los Morros, which falls to the Laguna de las Parrinas. The volcano of Llullaiyaco in the north is an independent peak, towering above the surrounding country, on which it exercises no genetic influence. Herr Darapsky says that the salt basins were, as a rule, exaggerated in size by the "Comision Exploradora," which in some cases threw several into one. They are possibly the remnants of larger basins, which existed when the amount of water in the country was greater. A necessary accompaniment of such a state of things would be a glaciation of the district, of which, however, the traces are not distinct, the universal presence of angular rock masses being easily explained otherwise. The writer suggests as possible that a change of climate has been caused by an alteration in the system of winds since the elevation of the great volcanoes; such an alteration being indicated by the presence of dunes where none are now formed. The paper concludes with tables of altitudes of the principal passes of the region.

POLAR REGIONS.

Sir G. Newnes' Antarctic Expedition.—Early in April the intimation was conveyed to us by Sir G. Newnes that the expedition under Mr. Borchgrevink had safely returned to New Zealand, after successfully accomplishing its objects. Telegraphing from Campbelltown, in South island, the leader announced that the highest latitude attained by the sledge-party was 78° 50′, the reaching of which constitutes a record in antarctic discovery, the highest point hitherto attained having been in 78° 10′, Ross's farthest, February, 1842. The most valuable result, however, is the fixing of the present position of the southern magnetic pole. The only misfortune to the party seems to have been the death of the zoologist, Nicolai Hansen, an experienced collector who had for some years worked for the British Museum. The expedition has arrived at Hobart, Tasmania.

Results of the Belgian Antarctic Expedition.—Pending the publication in Belgium of the full results of the Antarctic Expedition of De Gerlache, the summary of the work done, contributed to the second number of *La Géographie* by E. Racovitza, the naturalist of the expedition, supplies some interesting details. It is accompanied by a reproduction of the map of Lieut. Lecointe lately published by the Royal Belgian Geographical Society, showing the discoveries made by the expedition in the region north of Graham Land, with the various tracks of the vessel up and down Belgica strait, as the passage found between Danco Land and the Palmer archipelago has been named. The shores of the strait are mountainous, cut by narrow valleys, one of the peaks having apparently an altitude of 6000 to 7000 feet. The channels separating the various islands are deep, and the whole presents the appearance of a sunken land of which the valleys have been invaded by the sea. The land is composed of ancient crystalline rocks. Danco Land and the larger islands are covered with an ice-cap comparable with that of Greenland, but an examination of the moraines proved that the glaciers are retreating. Another important geographical discovery was that of a submarine plateau south-west of Graham's Land, between 75° and 103° W. and 70° and 71° 35′ S., with a mean depth of 500 metres (about 275 fathoms), while to the north there is a sudden drop to a depth of 1500 metres (820 fathoms). The existence of this continental plateau supports the idea of the continental character of the antarctic lands, while its greater depth, as compared with other continental plateaux, is another indication of subsidence in this region. The sediments obtained from this locality consist, in addition to grey mud, of a large proportion of sand, gravel, and rounded pebbles, which must have been derived from a sea-shore. The result of the voyage is to prove the non-existence of the land laid down by Walker, and also of that supposed by Cook to exist in about 150° E. M. Racovitza also sketches the results obtained in regard to magnetism, meteorology, oceanography, zoology, and botany. After pointing out the extreme scantiness of the fauna and flora of the lands visited (apart from the seals and sea-birds, the latter of which are very abundant in Belgica strait), he expresses the opinion that the antarctic fauna which existed before the invasion of the ice must have been entirely destroyed during subsequent glacial epochs. Even the existing species do not, he thinks, date from a pre-glacial period, but have been introduced by birds from America.

Ice in the Arctic Seas, 1899.—For some years the Danish Meteorological Institute has annually published useful information, derived from captains of ships and others, respecting the condition and movements of the ice in the seas east and west of Greenland, the most recent report giving the results for 1899. The work of the institute in this direction met with cordial recognition at the Berlin meeting of the International Geographical Congress, which passed resolutions in favour of

more extended observations, for which end the co-operation of other bodies was asked for, the Danish Institute being designated as the central office for the collection and preparation of information. Communications from observers are therefore appealed for by the latter, to which reports may be sent free of postage, addressed "Meteorological Institute, Copenhagen." The results for 1899 are given (1) for the sea round Spitsbergen and Novaya Zemlya; (2) for the Arctic ocean and Denmark strait; and (3) for Davis strait and Baffin bay, the state of the ice during each month for which observations are available being described. The following general conclusions are arrived at: (1) In the Kara sea, in the western part of Barents sea, and round a portion of Spitsbergen, as well as in Smith sound, more than the normal amount of ice seems to have been present. (2) South of Franz Josef Land, and under the east coast of Greenland, there was considerably less ice than usual. The favourable conditions in the latter regions are considered to be a natural result of the unfavourable conditions in the former, a drift having been set up by special wind-conditions. A good spring season is predicted for the present year off the south-west coast of Greenland. In the southern part of Davis strait icebergs were, last summer, extraordinarily scarce, there having apparently been a retardation of the drift of the bergs, possibly through grounding, a little north of Angmagsalik. The effect of these conditions on North American navigation remains to be seen.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A Mechanical Theory of the Formation of Mountains.—In a recent number of the *Comptes Rendus* of the French Academy of Science (vol. cxxx. No. 6) M. Marcel Bertrand sketches the outline of an ingenious theory of the origin of mountain ranges, by which the observed phenomena are accounted for by a series of mechanical displacements, each following as the immediate result of that which has preceded it. M. Bertrand's theory has immediate reference to the European system of mountains running from east to west parallel to the Mediterranean depression, but he apparently intends it to apply, with the necessary modifications, to certain of the great meridianal systems, *e.g.* the Urals and the Rocky mountains. The first stage supposed is that of a basin due to excess of weight over a given zone, to the north of which (in the case under consideration) runs a recently elevated mountain chain whence the basin tends to be filled by sedimentation. The excess of weight thus produced leads to the depression of the floor of the basin, and, as a necessary result, to the displacement of an equal mass at a lower level. This takes place in a southerly direction, and the result is a ridging up of the surface to the south of the basin, this constituting the second stage in the process. In the third stage, this ridge, having no counterpoise, is displaced by the force of gravity and the tensions existing within the Earth's crust, and is carried over the surface of the basin by a shearing movement which is sufficient to produce all the essential characters of mountain structure. The last stage consists in the elevation of the mass deposited in the form of a mountain range, which M. Bertrand accounts for thus. In the preceding movements, a substitution has taken place, within a given vertical zone, of less dense surface formations for an equal volume of the denser interior layers, and there is thus a tendency to reduce the original excess of weight. Coupled with this there has been a lateral displacement of the surface layers relatively to the deep-seated zone to which the excess of weight was due. A deficiency in weight is the result, and this occasions the elevation of the mass. M. Bertrand considers that the displacement of the sedimentary material from the mountain range to the depressed basin must be compensated by a displacement of the whole surface, probably affecting the outer layers only, and this in turn will

occasion a displacement of the axis of rotation of the Earth. He allows that the conclusions are not absolutely rigorous, but they coincide with the results obtained by a consideration of volcanic phenomena, which has enabled the writer to trace a curve on the globe representing the displacement of the pole in space.

Variation of Latitude at Teramo.—M. J. Boccardo gives in the *Comptes Rendus* (vol. cxxx. No. 6) the results of his observations, during the latter part of 1899, on the variation of latitude at the Observatory of Teramo, Italy. The determinations were made by the Horrebow-Talcott method, and were based on repeated observations of twenty-three pairs of stars, several being continued through four months. The results are based on over five thousand bisections of stars, while the greatest care was taken to eliminate errors by mutual compensation. The maximum variation of latitude obtained was almost 1″, the value for July being 42° 39′ 25″·89 (with probable error of ± 0″·051), and for October (at the end of which it reached a maximum) 42° 39′ 26″·82 (probable error, ± 0″·046). M. Boccardo points out that, while the variation obtained may seem excessive, the value (0″·3) commonly assigned to it is merely a mean. The value obtained for the latitude in October closely agrees with that adopted by M. Cerulli, from observations by the same method, stars, and instruments.

Lichtenberg's Contributions to Terrestrial Physics.—The centenary of the death of Georg Christoph Lichtenberg was last year celebrated by the German press, in which attention was principally directed to his work as a satirist and moralist. In the *Abhandlungen* of the Vienna Geographical Society (1899, pts. 2–3) Dr. S. Günther calls attention to Lichtenberg's contributions to the science of geophysics, which, though commonly left somewhat out of sight, are fully deserving of consideration. The German scientist, who was born near Darmstadt in 1742 or 1744, and in time became professor at Göttingen, in fact took a special interest in terrestrial physics, and his work in that direction shows him as an original and unprejudiced thinker. His contributions to the various branches of the science are briefly sketched by Dr. Günther, who points out many instances in which his ideas were distinctly in advance of his time. The progress of geographical discovery aroused in him a keen interest, and connections formed during two visits to England enabled him to keep his countrymen informed of the work of English explorers, especially Cook, of whose voyages he published a lively account. He also paid attention to mathematical geography, and his determinations of positions in Hanover are among the most accurate of his time. His originality as a thinker is shown by his theory of a gaseous interior of the Earth, in regard to which he gave more definite shape to the somewhat vague ideas of Franklin. In the domain of geology, he paid attention to volcanic phenomena, and showed the analogy between those of the Earth and of the moon. The tendency of the lands of the globe to terminate southwards in a point, with an island to the east, was noticed by him, and the search for an explanation recommended. Meteorology seems to have exercised on him a special attraction, and his ideas as to the system of the winds were in great measure correct; while his theory of atmospheric vapour—in close agreement with that now adopted—is considered by Dr. Günther as his most genuine contribution to science. As a teacher Lichtenberg enjoyed a high reputation, and one of his courses was attended by Alexander van Humboldt, who, no doubt, there laid in part the foundation of his future insight into natural laws.

GENERAL.

The River as a Boundary.—The importance of the river as a boundary between civilized and uncivilized peoples is discussed by Oskar Emil Junghans in his inaugural dissertation for the degree of doctor at Leipzig University, recently

issued in pamphlet form. After a preliminary glance at the various forms of boundary supplied by natural features, the writer discusses the varying *rôle* played by the river in relation to primitive and civilized man, insisting on its importance as a boundary in the case of the former, and as an aid to culture in the case of the latter. Having then laid down as the requirements of a boundary between the two classes of peoples, (1) that it must present the idea of a boundary in a conspicuous form; (2) that it must afford protection from inroads; (3) that it must allow free intercourse and further the extension of culture; the writer endeavours to prove by historical instances, especially the case of the Romans and Germans, that the river best meets these requirements, possessing decided advantages as compared with the mountain range. He is perhaps inclined to give too wide an application to the principles laid down, and to leave out of account special factors which may help to determine the choice of a river as boundary, *e.g.* the direction of its flow relatively to the line of advance of civilization, its navigability or the reverse, and the nature of the country through which it passes. The instances adduced might easily be matched by others from which a contrary conclusion could be drawn, while the double function of arteries of civilization and boundaries between civilized and uncivilized peoples could rarely be performed by the rivers of one and the same region. The author gives frequent references to the works of Ratzel and other writers on anthropogeography, as well as to the statements of travellers, on both of which his work is to a large extent founded. Few authorities, other than German, seem, however, to have been consulted.

OBITUARY.

General Sir William S. Lockhart.

By Colonel Sir Thomas H. Holdich, K.C.I.E., C.B.

Sir William Stephen Alexander Lockhart, who died at Calcutta on March 18, was a Fellow of the Royal Geographical Society, and throughout his adventurous and successful career he was ever an ardent supporter of geographical enterprise. He attained great renown as an able general in the field, and he died Commander-in-Chief in India. Had he given his life to the cause of geography, he would have achieved equal success as an explorer; for he was not only a most close and careful observer, and a good descriptive writer, he was a born leader of men, and he loved the field of adventure.

Sir William was the son of a Scotch laird-parson, the Rev. L. Lockhart, of Milton Lockhart, in the county of Lanark. He was intensely proud of the name he bore and of his descent from an ancient house, and he inherited much of the literary ability of that house; his uncle being John Gibson Lockhart, the well-known author of the 'Life of Scott.' Few even of his best friends knew that Sir William indulged a fancy for poetry as well as for prose.

His military record is part of the recent history of India. In 1858, at the age of seventeen, he entered the service as a lieutenant in the 44th Bengal Infantry, with which regiment he was associated for ten years. He served for a few months in Oudh with the 5th Fusiliers, and his subsequent war services include campaigns in India, Afghanistan, Abyssinia, Burmah, and Sumatra. As adjutant of the 14th Bengal Cavalry, he was in the Bhutan campaign of 1864-66. As aide-de-camp to General Merewether, he was in Abyssinia in 1868, and witnessed the fall of Magdala. As D.A.Q.M.G., he was subsequently with

the Hazara field force in the Black Mountain Expedition. In 1875–77 (for want of a field in India) he served in the Dutch war in Achin, and received the Dutch war medal and clasp. There he nearly died, for he was struck down with fever at the end of the campaign, which stretched him helpless at the port of debarkation. He was road commandant in the Khaibar at the commencement of the Afghan war of 1879–80, and finally acted as A.Q.M.G. with Roberts's force at Kabul, where he took part in all the engagements of that winter. By this time he had attained the rank of lieut.-colonel, and the decoration of C.B. During 1885–86 he conducted a political expedition to Chitral, which was, to a certain extent, the complement of the Russo-Afghan Boundary Commission on the Oxus. It was during this expedition that he showed his capacity and courage as an explorer. That adventurous journey through Hunza and across the Hindu Kush (where he was first to show the way) was so fraught with danger from the treacherous hostility of the fierce old Hunza chief, Ghazan Khan, that it is a marvel how his little party (which included his great friend Woodthorpe) escaped the traps that were laid for it. Nor were matters much improved when, after crossing the Kilik with infinite difficulty, and pushing his way down the Wakhan to Ishkashim on the Oxus, he found himself face to face with determined opposition organized at Kabul. Unable to penetrate Badakshan, the party crossed by the Dorah into the Arnawai, or Bashgol, valley of Kafirstan, and so made their way to Chitral. Independently of its political significance, that journey was a great geographical record. Geographically, it was perhaps Woodthorpe's opportunity rather than Lockhart's; but it was Lockhart's earnest and determined support of Woodthorpe that enabled the latter to achieve his brilliant success. In the remote wilds of the Bashgol, Lockhart is still remembered as the typical "Sahib," and it would be well if that type could be ever represented in strange lands as it was then—by commanding personality and chivalrous disposition.

In the winter of 1886–87 he obtained his first command of a brigade in Burmah; and his K.C.B. quickly followed. In March, 1887, he obtained a brigade in the Bengal command, and two years later joined the Headquarter Staff as Assistant Military Secretary. He commanded the two Meranzai expeditions of 1891, and first showed the way into the Khanki valley across the Samana range. This brought him his promotion to the rank of major-general, and after the Isazai expedition of the following year he became lieutenant-general, and attained the Punjab divisional command. The Waziristan campaign of 1894 gave him another opportunity of sweeping a difficult hill country clear of an active enemy, and for the third time he received the thanks of the Government of India.

His last campaign was in 1897, when he found himself in command of 40,000 British and native troops on the Indian frontier with Tirah before him, and perhaps the most difficult series of operations to carry to a successful issue against a well-armed foe that any Indian general had as yet encountered on the frontier. There was much heavy fighting and considerable loss, but the result was a complete and thorough exploitation of all those hitherto unknown highlands at the base of the Sufed Koh; and the final subjugation of a people who were but seldom to be seen, and were never caught asleep. Nothing more could have been done than Lockhart did, and nothing could have been more satisfactory to him than the candid acknowledgment of his foes that he was their master, even in mountain tactics. Shortly after Tirah he succeeded Sir G. White as Commander-in-Chief in India.

The force of Lockhart's character lay not alone in the energy and ability which he brought to bear on his immediate military or political duties. His heart was as sound as his head. A careful adviser, a faithful friend, a genial and kindly companion, whose unswerving honesty of purpose was never to be doubted for an instant—such was

Lockhart. He will be remembered by many for his brilliant qualities as a general and leader. He will be remembered by not a few as a wise and chivalrous friend; as the man who, when leader of an expedition in which baggage was light and tents were scarce, tossed up on equal terms with the whole party for the doubtful privilege of sleeping out—and won; as the man who picked up the worn-out Balti coolie from the snow and carried him into camp (and a Balti coolie is not a sweet burden); as the man who declined the pleasures of a public reception and entertainment to seek out a sick friend who had been suddenly struck down, and sit with him and cheer him for an hour; as the man who could never reconcile himself to the adjustment of a boundary which gave the Bashgol valley to the Amir, because he had himself given the right hand of fellowship to its Kafir chief.

Tall and straight and strong as he looked, Lockhart's constitution was not equal to his appearance. At the close of the Tirah campaign he was so beset with fever that many of his friends doubted if he could ever recover. Perhaps he never did; for when I saw him last (at the Aldershot review of the summer of 1898), and congratulated him on his high appointment as chief in India, he did not speak of the future in terms of his usual hopeful enthusiasm. It was not the Lockhart of Kabul who went to Simla. He married twice—first Caroline Camelia, daughter of Major-General E. Lascelles Dennis; and secondly, in 1888, Mary Katherine, daughter of the late Captain W. Eccles, of the Coldstream Guards.

At the evening meeting of March 19, the PRESIDENT made the following remarks: Before announcing the business of the evening, I cannot help referring to the loss the Society has sustained in the death of the Commander-in-Chief in India. Sir Wm. Lockhart was an old Fellow of this Society. He was a man who took a deep interest throughout his life in geography, having begun exploring when very young with the Bhutan expedition, then with the Abyssinian expedition, afterwards he did most valuable work when attached to the Dutch army in Achin, when he sent home memoirs and very valuable maps. Few men saw more of the various frontiers of India, and in more recent times he commanded the expedition to Chitral and the Pamirs, which was the first to explore the upper course of the true Oxus. Sir Wm. Lockhart as a young man was imaginative and enthusiastic, and no mean poet. I remember that he wrote stanzas on the deed of his ancestor who accompanied Lord Douglas when he took the heart of Robert Bruce to the Holy Land; also, I remember a poem of his of considerable merit in imitation of the Œnone of Tennyson. He was then a most charming companion, well informed, genial, and most obliging. As he was as a young man he continued through life, and made many dear friends who now mourn his loss. It is not for me to speak of his greater and higher qualities as a soldier, but I think I may truly say that in Sir William Lockhart the country has lost a most valuable public servant.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1899–1900.

Afternoon Technical Meeting, Tuesday, March 27, 1900.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The Paper read was:—

"Methods adopted in Surveying the Cordilleras of the Andes." By Prof. Bertrand, of the Chilian Survey.

Ninth Ordinary Meeting, April 2, 1900.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Rev. William Esdaile, M.A.; Allan A. Forster; J. H. Hyde Johnson, M.A. (Oxon.); Robert Nunez Lyne; Donald A. MacAlister; Captain Reginald James Macdonald, R.A.; Lieut.-Colonel Percy Hugh Hamon Massy (6th Dragoon Guards); Hon. Walter Maxwell.*

The Paper read was:—

"Explorations in Central Asia." By Captain H. H. P. Deasy.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo, quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Historical. *Annuaire Club Alpin Français* **25** (1898): 544–555. **Maugin.**

Passage des Alpes et du col de la Faucille par un pèlerin de 1518, d'après la relation de Le Sage. Par M. Gustave Maugin.

Austria—Bohemia. *Globus* **77** (1900): 8–13. **Zemmrich.**

Die Zustände an der Sprachgrenze in Westböhmen. Von Dr. J. Zemmrich. *With Map.*

Austria—Salzkammergut. *Abh. G. Ges. Wien* **1** (1899): 137–178. **Lorenz.**

Aeltere und neuere Lothungen im Hallstätter See. Von Dr. Josef Roman Ritter Lorenz von Liburnau. *With Plates.*

Austria—Tyrol. *Annuaire Club Alpin Français* **25** (1898): 140–200. **Vielliard.**

A travers le Tyrol: Oetzthal et Dolomites occidentales. Par M. Edme Vielliard. *With Illustrations.*

Denmark—Archæology. *Mém. S.R. Antiquaires Nord* (1899): 229–296. **Müller.**

Notice sur les fouilles faites pour le Musée National de Copenhague, pendant les années 1893–1896. Par Sophus Müller, traduite par Eug. Beauvois. *With Illustrations.*

Denmark—Meteorology.

Annuaire météorologique pour l'année 1896. Publié par l'Institut météorologique Danois. Deuxième partie (1800, pp. 98); Ditto pour l'année 1898. Première partie. Kjøbenhavn, 1899. Size 14 × 9½, pp. vi. and 140.

Europe—Historical. *B.A.R. Belgique* **35** (1898): 78–92. **Piot.**
Les Frisons en Flandre. Par Ch. Piot.
On the Frisians or Franks, the free north-western German tribes, in Flanders at an early period.

France. *Mém. A. Dijon* **6** (1898): 99–399. **Picard.**
Histoire d'une forêt communale. La Forêt des Crochères à la ville d'Auxonne. Par M. Etienne Picard. *With Map and Plate.*
The history of this forest is traced from 1298 onwards.

France. *Mém. S. Spéléologie* **3** (19) (1899): 1–40. **Martel.**
10e Campagne souterraine (1897). Première Partie. La Grotte de la Balme (Isère)—Recherches en Savoie et en Suisse. Par M. E. A. Martel. *With Plans and Illustrations.*

France. *Mém. S. Spéléologie* **3** (18) (1899): 1–36. **Mazauric.**
Explorations souterraines dans le Gard, l'Ardèche et l'Hérault (Campagne de 1898). Par M. Félix Mazauric. *With Plans and Illustrations.*

France. *A travers le Monde, Tour du Monde* **6** (1900): 13–14. **Noussanne.**
La Canal des Deux Mers.—De l'Atlantique à la Méditerranée.—Son double avantage commercial et militaire. Par M. H. de Noussanne. *With Map.*
M. Verstraëte's project of a canal uniting the Bay of Biscay and the Gulf of Lions.

France—Alps. **Cessole and Maubert.**
Annuaire Club Alpin Français **25** (1898): 332–370.
La vallée de la Gordolasque (Alpes-Maritimes). Par MM. Victor de Cessole et Louis Maubert. *With Illustrations.*

France—Brittany. *A travers le Monde, Tour du Monde* **6** (1900): 9–11. ——
Le Passé, le Présent et l'Avenir de l'Ile de Sein. *With Illustrations.*
This island has suffered much by coast-erosion.

France—Cevennes. *Annuaire Club Alpin Français* **25** (1898): 285–331. **Nauzières.**
Le Sidobre. Par M. Raymond Nauzières. *With Map and Illustrations.*

France—Gard. *C. Rd.* **130** (1900): 213–220. **Bertrand.**
Le bassin houiller du Gard et les phénomènes de charriage. Note de M. Marcel Bertrand.

France—Gascogne. *Deutsche G. Blätter* **22** (1899): 235–256. **Le Mang.**
Die Dünen der Gascogne. Von Richard Le Mang. *With Map.*

France—Meurthe. *B.S.G. de l'Est* (1899): 23–30. **Bleicher.**
La colline de Malzéville. Par M. le professeur Bleicher. *With Plate.*
Particulars of a prehistoric masonry wall found on the Malzéville hill.

France—Mont Blanc. *Spelunca* **4** (1898): 171–176. **Vallot.**
Exploration des Moulins de la Mer de Glace. Par M. J. Vallot. *With Plans.*

France—Rhone Glacier. *Spelunca* **4** (1898): 156–158. **Forel.**
Circulation des Eaux dans le Glacier du Rhône. Par M. F. A. Forel.

Germany—Hamburg. ——
Wegweiser durch Hamburg und Umgebung. Hamburg: F. W. Rademacher [*not dated*]. Size 7 × 4½, pp. 94. *Plan and Illustrations. Presented by Dr. J. Scott Keltie.*

Italy. **Smith.**
A Pilgrimage to Italy. An Account of a Visit to Brindisi, Naples, Mount Vesuvius, Pompeii, Rome, Florence, Venice, and Milan. By the Rev. James Smith, B.D., with Introductory Preface, by the Very Rev. F. W. Farrar, D.D., F.R.S. Aberdeen, 1899. Size 9 × 6, pp. x. and 512. *Maps, Plans, and Illustrations. Price* 8s. 6d. *Presented by the Author.*
The record of a trip through Italy, illustrated with unusual richness, and displaying a keen appreciation of the manifold interest of the parts of the country which were visited.

Italy—Sassuolo. *Globus* **77** (1900): 37–42. **Greim.**
Ein Besuch der Schlammsprudel von Sassuolo. Von Dr. G. Greim. *With Illustrations.*

Montenegro. *B.S.R.G. d'Anvers* **23** (1899): 367–390. **Levy.**

Au Monténégro. Par M. Victor Levy.

Norway—Meteorology. **Mohn.**

Jahrbuch des Norwegischen Meteorologischen Instituts für 1898. Herausgegeben von Dr. H. Mohn. Christiania, 1899. Size 13½ × 10, pp. xii. and 122.

Russia—Finland. *Fennia* **15** (1897–1899) (No. 3): 1–210. **Andersson.**

Studier öfver Finlands torfmossar och fossila kvartärflora. Af Gunnar Andersson. German abstract, pp. 181–210. *With Plates.*

On the plants of the peat-mosses of Finland and the Quaternary flora of the country.

Russia—Finland. *Fennia* **14** (1897–1899) (No. 1): 18–20. **Hackman.**

Neue Beobachtungen über die Ausbreitung des Yoldia-meeres in Finland. Von Victor Hackman. *Also* Om i norra Finland iakttagna senglaciala strandmärken, No. 5, pp. 1–8. *With Maps.*

German abstract of a paper in Swedish on the probable limits of the late glacial Yoldia lake in the centre of Finland. The second map indicates the probable extension of the lake on both sides of the Gulf of Bothnia.

Russia—Finland. *Fennia* **14** (1897–1899) (No. 6): 1–31. **Hausen.**

Spridda uppgifter om navigationen samt lots—och båkväsendet vid Finlands sydkust under äldre tider. Af Reinh. Hausen. German abstract, pp. 29–31. *With Map and Plates.*

On the navigation, pilotage, and beacons on the south coast of Finland in early times. The map is the reproduction of a Dutch chart of part of the eastern Baltic, evidently of the early part of the sixteenth century.

Russia—Finland. *Fennia* **14** (1897–1899) (No. 7): 1–71. **Rosberg.**

Ytbildningar i Karelen med särskild hänsyn till ändmoränerna. II. Af J. E. Rosberg. German Abstract 64–71. *With Map.*

On the terminal moraines, eskers, and other glacial remains of Eastern Finland.

Russia—Finland. *Fennia* **15** (1897–1899) (No. 5): 1–195. **Savander.**

Détermination relative de la pesanteur à Helsingfors, précédée d'un Aperçu sur les formules de réduction. Par Otto Savander. *With Plates.*

On gravity observations made at Helsingfors, with details and figures of the pendulums employed in the research.

Russia—Finland. *Fennia* **14** (1897–1899) (No. 4): 1–52. **Saxén.**

Finlands kommuners namn i Svensk skrift. Af Ralf Saxén. *With German abstract.*

This paper in Swedish, and another of 54 pp. in Finnish by Väinö Wallin, discuss the names of the communes of Finland in their Swedish and Finnish forms, giving a complete alphabetical list in each language. The lists were originally compiled by the Finnish Geographical Society, and distributed widely over the country, in order to collect all variations of the names, and the data thus procured were then discussed, and the lists now published indicate the forms which are most probably correct, and which the Society desires to see superseding the haphazard spelling now employed on maps.

Russia—Finland. *Fennia* **14** (1897–1899) (No. 8): 1–19. **Tigerstedt.**

Magnetiska undersökningar i trakten af Jussarö. Af A. F. Tigerstedt. German Abstract, pp. 14–19. *With Maps.*

A remarkably detailed magnetic survey of a small portion of the coast of South-Western Finland.

Russia—Kola Peninsula. *Fennia* **15** (1897–1899) (No. 2): 1–27 (No. 4): 1–15. **Ramsay.**

Das Nephelinsyenitgebiet auf der Halbinsel Kola. II. Von Wilhelm Ramsay. Neue Beiträge zur Geologie der Halbinsel Kola. Von Wilhelm Ramsay.

Describes geological observations at various points on the Murman coast and on the island of Kildin.

Russia—Ladoga. *Fennia* **14** (1897–1899) (No. 2): 1–43. **Ailio.**

Ueber Strandbildungen des Litorinameeres auf der Insel Mantsinsaari. Von Julius Ailio. *With Map.*

The island of Mantsinsaari lies in the north-east of Lake Lodoga, and is largely formed of deposits left by the Litorina sea, the recession of which may be studied by the lines of ancient beaches.

Russia—Novgorod. *Tour du Monde* **5** (1899): 613–624. **Albizzi.**

Visite à Novgorod la Grande (une ancienne capitale de la Russie). Par M. le Marquis degli Albizzi. *With Illustrations.*

Spain. *B.S.G. Madrid* **41** (1899): 242–248. **Blázquez.**

Vias romanas españolas. Por D. Antonio Blázquez y Delgado Aguilera. Vias numeros 19 y 20.

Spain—Sierra Nevada. *Abh. G. Ges. Wien* **1** (1899): 179–326. **Rein.**

Beiträge zur Kenntnis der Spanischen Sierra Nevada. Von Dr. Johannes Rein. *With Maps. Also separate copy, presented by the Author.*

A thorough geographical study of the Sierra Nevada with regard to all the conditions of the range and of its inhabitants. The memoir concludes with a bibliography of the region.

United Kingdom—England. *Quarterly J. Geolog. S.* **56** (1900): 138–197. **Groom.**

On the Geological Structure of Portions of the Malvern and Abberley Hills. By Prof. T. T. Groom. *With Map.*

United Kingdom—England. **Davison.**

Quarterly J. Geolog. S. **56** (1900): 1–7.

On the Cornish Earthquakes of March 29 to April 2, 1898. By Charles Davison, sc.d. *With Map.*

United Kingdom—England. ———

Sixtieth Annual Report of the Registrar-General of Births, Deaths, and Marriages in England (1897). London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. cxliv. and 308. *Price* 1*s.* 10*d.*

United Kingdom—North Wales. *Gelog. Mag.* **7** (1900): 18–20. **Dakyns.**

Modern Denudation in North Wales. By J. R. Dakyns.

ASIA.

Asia—Historical. *Rev. Scientifique* **13** (1900): 204–207. **Saint-Yves.**

Les peuples retrouvés de l'Asie Centrale. Par M. G. Saint-Yves.

This article, which is translated from the Russian, deals with the deductions from two ancient monuments on the shores of Lake Tsaïdam and one at Orkhon.

China. **Cholnoky.**

Vándorlásaim a Mennyei Birodalomban. [Cholnoky Jenö.] (Különlenyomat a "Természettudományi Közlöny" 356-ik füzetéből.) Size 10 × 7, pp. 169–192. *Illustrations. Presented by the Author.*

China—Railways. *Questions Dipl. et Colon.* **8** (1899): 459–468. **Fauvel.**

Les Chemins de fer chinois.—Travail d'organisation. Par M. A. A. Fauvel.

China—Yunnan. *B.S.G. Com. Paris* **21** (1899): 315–324. **Angoulvant.**

Les voies d'accès au Yunnan et le commerce avec ce pays. Par M. Gabriel Angoulvant.

Chinese Geography. **Schlegel.**

Geographical Notes. XIII. Tan-tan or Dan-dan, Dondin? XIV. Ko-la or Ko-la Pu-sa-lo, Kora or Kora Bësar. XV. Moa^{n}-la-ka, Malacca. By G. Schlegel. Reprinted from the *T'oung-Pao*, vol. x. No. 5. Leyden: E. J. Brill, 1899. Size 10 × 6½, pp. 22. *Presented by the Author.*

Chinese Studies. **Cordier.**

Les études chinoises (1895–1898). Par Henri Cordier. (Extrait du Supplément au Volume ix. du 'T'oung-pao,' No. 5.) Leide: E. J. Brill, 1898. Size 10 × 6½, pp. 142.

Chinese Turkestan. *La G., B.S.G. Paris* (1900): 93–110. **Saint-Yves.**

Turkestan chinois et Pamirs (Juillet-Décembre 1899). Par M. G. Saint-Yves. *With Map and Illustrations.*

Dutch East Indies. **Colenbrander and Van der Chijs.**

Dagh-Register gehouden int Casteel Batavia vant passerende daer ter plaetse als over geheel Nederlandts-India, Anno 1631–1634. (Pp. vi. and 480.) Ditto. Anno 1636. Uitgegeven door het Departement van Koloniën onder toezicht van Dr. H. T. Colenbrander. 's-Gravenhage, M. Nijhoff, 1898–99. Size 11 × 7½, pp. viii. and

312. Ditto. Anno 1670–1671. Uitgegeven door het Bataviaasch Genootschap van Kunsten en Wetenschappen, met medewerking van de Nederlandsch-Indische Regeering en onder toezicht. Van Mr. J. A. Van der Chijs. 's-Hage: M. Nijhoff, 1898. Size 11 × 7½, pp. 530.

Eastern Asia. **Hannah.**

A Brief History of Eastern Asia. By J. C. Hannah, M.A. London: T. Fisher Unwin, 1900. Size 8 × 5½, pp. xvi. and 304. *Price* 7*s.* 6*d.* *Presented by the Publisher.*

Beginning with China in the remotest ages, the author sketches the history of the whole of Asia, with the exception of Persia and Asiatic Turkey, down to the present day. There is a copious index and a list of books of reference, which would be improved by adding the place and date of publication to the titles.

French Indo-China. *Annuaire Club Alpin Français* **25** (1898): 453–512. **Salles.**

Au Tonkin et en Annam. Par M. A. Salles. *With Illustrations.*

French Indo-China. *Rev. Scientifique* **13** (1900): 11–15, 109–114. **Leclère.**

La culture du riz au Cambodge. Par M. Adhémard Leclère.

French Indo-China—Tonkin. *B.S.G. Paris* **20** (1899): 414–432. **d'Anty.**

De Hanoï à Mongtze. Par M. Bons d'Anty.

India. *B.A.R. Belgique* **34** (1897): 155–208. **Alviella.**

Des influences classiques dans l'art de l'Inde par le comte Goblet d'Alviella. *With Illustrations.*

India. *B.A.R. Belgique* **34** (1897): 484–534. **Alviella.**

Des influences classiques dans la culture scientifique et littéraire de l'Inde. Par le comte Goblet d'Alviella.

India—Andaman Islands. *Indian Antiquary* **28** (1899): 323–331. **Temple.**

Miscellaneous Papers relative to the Settlements in the Andaman Islands in the XVIIIth Century. Preface by R. C. Temple.

India—Historical. *J.E. India Assoc.* **31** (1900): 6–35. **Rattigan.**

The Mogul, Mahratta, and Sikh Empires in their Zenith and Fall. By Sir William Rattigan, Q.C.

India—Railway Communication. *J.S. Arts* **48** (1900): 274–284. **Maclean.**

New Projects of Railway Communication with India. By J. M. Maclean, M.P.

This paper discusses the question of an all-land route to India in its political aspects.

Korea. *La G., B.S.G. Paris* (1900): 35–50. **Monnier.**

A travers la Corée. Par M. Marcel Monnier. *With Map and Illustrations.*

Malay Archipelago. **Van der Kemp.**

Bijd. Taal-, Land- en Volkenk. Med.-Indië **7** (1900): 1–101.

De Commissiën van den Schout-bij-nacht C. J. Wolterbeek naar Malakka en Riouw in Juli—December 1818 en Februari—April 1820. Met aanteekeningen. Door P. H. van der Kemp.

Malay Archipelago—Java. *Ann. Hydrographie* **27** (1899): 581–587. ——

Java, Nordküste.

Malay Archipelago—Java. *B.A.R. Belgique* **34** (1897): 773–781. **Leclercq.**

Les volcans de Java. Par Jules Leclercq.

Malay Archipelago—Lombok. **Faille.**

Tijds. Indische Taal-, Land- en Volkenk. **41** (1899): 416–428.

Bij de situatie-kaart van het lustverblijf te Narmada (Lombok). Door P. de Roo de la Faille. *With Map.*

Persia—Lake Urmi. *J. Linnean S., Zoology* **27** (1899): 345–453. **Günther.**

Contributions to the Natural History of Lake Urmi, N.W. Persia, and its Neighbourhood. By Robert T. Günther, M.A. *With Map and Plates.*

Philippine Islands. *National G. Mag.* **11** (1900): 1–14. **Barrett.**

The Philippine Islands and their Environment. By Hon. John Barrett. *With Map.*

Russia—Turkestan. *Questions Dipl. et Colon.* **9** (1900): 146–162. **Venukoff.**

La Question du Turkestan. Par M. Venukoff.

Sven Hedin's Journeys. **Brunner.**

Durch Asiens Wüsten. Sven Hedins Reisen und Forschungen 1894–97. Von Heinrich Brunner. Zurich, 1899. Size 7½ × 4½, pp. 70. *Presented by the Author.*

Turkey—Palestine. **Clermont-Ganneau.**

Archæological Researches in Palestine during the years 1873–74. By Charles Clermont-Ganneau, LL.D. Vol. i. With numerous illustrations from drawings made on the spot by A. Lecomte du Noüy, architect. Translated by Aubrey Stewart, M.A. Published for the committee of the Palestine Exploration Fund, 1899. Size 11½ × 9, pp. xviii. and 528. *Presented by the Palestine Exploration Fund.*

This volume completes the set of the 'Survey of Palestine,' and deals almost exclusively with the archæology of Jerusalem, special prominence being given to the mediæval architecture of the Crusading period.

Turkey—Telos. *Globus* 77 (1900): 46–48. **Vincenz.**

Ein Besuch auf der Insel Telos. Von Friedrich v. Vincenz. *With Illustrations.*

Yellow Sea. *Ann. Hydrographie* 27 (1899): 577–581. ——

Aus den Reiseberichten Seiner Majestät Schiffe. *With Chart.*

The German men-of-war on the Chinese station are engaged in making additional soundings on the coast of Shantung, and their soundings are being published, as in this instance, on very transparent white tracing paper, intended to be laid over a portion of the British Admiralty chart so as to bring the new soundings into relation with the old.

AFRICA.

Africa—Commerce. ——

Commercial Africa in 1899. Area, Population, Production, Railways, Telegraphs, Transportation Routes, Foreign Commerce, and Commerce of the United States with Africa. [From the summary of Commerce and Finance for August, 1899.] U.S. Treasury Department, Bureau of Statistics. Size 12 × 9½, pp. 321–467. *Map.*

A discussion of the commercial geography of Africa, giving the latest data, with the object of promoting American trade.

British Central Africa. *Scottish G. Mag.* 16 (1900): 82–89. **Henderson.**

Northern Nyasaland. By the Rev. James Henderson.

An excellent epitome of geographical observations made during several years' missionary work in northern Nyasaland.

Egypt—Fayum. *B S. Khédiv. G.* 5 (1899): 253–295. **Zéki.**

Une description arabe du Fayoum au VII^e^ siècle de l'hégire. Par Ahmed Zéki Bey.

A description of the Fayum written in the thirteenth century by an Arab writer, Abu Osman el Nabulsi el Safadi.

Egypt—Geography. *B.S. Khédiv. G.* 5 (1899): 297–324. **Bonola.**

Le Musée de Géographie et d'Ethnographie de la Société. Notice par le Dr. Frédéric Bonola Bey. *With Illustrations.*

The Khedivial Geographical Society opened a museum at Cairo in 1898, containing maps and reliefs of Egypt, and representative collections of the products of all the Egyptian provinces from the Equatorial regions to the Mediterranean.

Egypt—Nile. *Blackwood's Mag.* 167 (1900): 247–249. **Wallace.**

The Low Nile of 1899, in relation to the Cotton Crop of 1900. By S. W. Wallace.

Egyptian Sudan. *Mouvement G.* 17 (1900): 61–63. **Henry.**

Le commandant Henry sur le haut Nil. *With Map and Portrait.*

Egyptian Sudan. *Scottish G. Mag.* 16 (1900): 89–92. **Milne.**

The Dry Summer on the Upper Nile. By A. D. Milne, M.B., C.M.

Observations on the rainfall and the volume of the Nile in the Equatorial Province in the summer of 1899.

French Sudan—Timbuktu. **Klobb.**

Renseignements Colon. Comité l'Afrique Française, No. 9 (1899): 157–168.

La région de Tombouctou: Le dernier rapport du Colonel Klobb.

French West Africa. *J.R. United Service I.* **44** (1900): 111–136. **Hilliard-Atteridge.**

Recent French Expeditions in West Africa, 1894–1899. By Captain A. Hilliard-Atteridge. *With Maps.*

Traces the French explorations and military operations in West Africa from 1894 to 1899.

French West Africa. *B. Comité l'Afrique Française* **9** (1899): 368–372. ——

La réorganisation de l'Afrique occidentale française. *With Map.*

French West Africa. *La G., B.S.G. Paris* (1900): 30–34. **Binger.**

Les Lignes télégraphiques dans l'Afrique occidentale française. Par M. L. G. Binger. *With Map.*

French West Africa. *B. Comité l'Afrique Française* **9** (1899): 362–368. **Bretonnet.**

Le massacre de la mission Bretonnet. *With Portrait.*

German East Africa. *Verh. Ges. Erdk. Berlin* **26** (1899): 437–452. **Bornhardt.**

Herr Berg-Assessor W. Bornhardt: Geographische und geologische Mitteilungen über das deutsche Nyassa Gebiet auf Grund eigener Reisen. *With Map.*

A note on this paper appears in the *Journal* for April, p. 421.

German East Africa. **Oechelhäuser.**

Beiträge Kolonialpolitik u. Kolonialwirtschaft (1899): 1–6.

Die deutsch-ostafrikanische Zentralbahn. Von Dr. Wilhelm Oechelhäuser.

German East Africa—Victoria Nyanza. **Kollmann.**

The Victoria Nyanza. The Land, the Races, and their Customs, with Specimens of some of the Dialects. By Paul Kollmann. London: Sonnenschein & Co., 1899. Size 9½ × 6½, pp. x. and 254. *Map and Illustrations. Price 7s. 6d.*

During his several journeys in the region of the Victoria Nyanza, the author acquired much information regarding the people—their customs and usages, mode of life, and ethnographic relations—and made extensive collections of all kinds. The results are given in the present volume, which is rendered all the more useful by a number of sketches of implements, weapons, etc., used by the natives in this portion of German East Africa. The book is translated by Mr. H. F. Nesbitt.

German South-West Africa. **François.**

Deutsch-Südwest-Afrika. Geschichte der Kolonisation bis zum Ausbruch des Krieges mit Witbooi, April 1893, von C. von François. Berlin: Dietrich Reimer (Ernst Vohsen), 1899. Size 11½ × 8, pp. 224. *Maps. Price 8m. Presented by the Publisher.*

A history of German South-West Africa from the period of its declaration as a German protectorate in 1883 until 1893. The nature of the country and the people are considered, and also the whole question of German colonization during the interesting period when the definite acceptance of its position as a colonial power was still under discussion in Germany.

German West Africa. *Deutsch. Kolonialblatt* **11** (1900): 135–139. **von Kamptz.**

Bericht über die erfolgreiche Beendigung des Wute-Adamaua-Feldzuges. Bericht von Hauptmann von Kamptz.

German West Africa—Togo. **Hupfeld.**

Deutsche Kolonialzeitung **16** (1899): 405–406, 423–424, 433–434.

Die Verkehrsverhältnisse in Togo. Von Fr. Hupfeld. *With Map.*

German West Africa—Togo. **Klose.**

Togo unter Deutscher Flagge. Reisebilder und Betrachtungen von Heinrich Klose. Berlin: Dietrich Reimer (Ernst Vohsen), 1899. Size 10½ × 7, pp. xxii. and 562. *Map and Illustrations. Price 14m. Presented by the Publisher.*

Herr Klose describes the German colony of Togo in considerable detail, both with regard to the country, its productions, and people. The book is richly illustrated.

Madagascar. *La G., B.S.G. Paris* (1900): 1–29, 111–140. **Galliéni.**

Madagascar (1896–1899). Par M. le Général Gallieni. *With Maps.*

Madagascar. **Grandidier.**

Sur les travaux géographiques et cartographiques exécutés à Madagascar par ordre du général Gallieni, de 1897 à 1899. Par M. Alfred Grandidier. (Extrait des *Comptes rendus des séances de l'Académie des Sciences*, t. cxxxix., séance du 10 Juillet 1899.) Size 11 × 9, pp. 8.

Madagascar. *B.S.G. Com. Paris* **21** (1899): 325–337. **Jully.**

Madagascar de 1890 à 1899. Le passé et l'avenir. Par M. Ant. Jully.

Madeira. **Biddle.**

The Madeira Islands. By Anthony J. Drexel Biddle. 2 vols. Volume i., with Forty-seven full-page Illustrations, a Map of Funchal, and a section of the Medici Map, and comprising the History of the Madeiras; Information for the Traveller and Visitor; a Treatise descriptive of the Natives, their characteristics, religion, laws, and customs; and an account of the Commerce. Volume ii., with Twenty-nine full-page Illustrations; Maps of Madeira showing districts devoted to Vine-culture, and the mountains and their heights; and Facsimiles of old Bills of Lading, and treating of the Geography and Geology, the Flora, the Vine and the Wine, and the Fauna. London: Hurst & Blackett, 1900. Size 8½ × 6, pp. (vol. i.) 324; (vol. ii.) 208. *Price* 20*s. net. Presented by the Publishers.*

In the preparation of these volumes, the writer, we are told in the Preface, had a twofold purpose in view—"to make, on the one hand, a ready-reference book for the student, with a complete set of footnote references and alphabetical lists and indexes; and, on the other hand, a readable narrative for the lover of travel, exploration, and adventure." Judging from the contents, the author appears to have succeeded in these objects, and to have treated his subject very fully. He maintains the early discovery of Madeira by Machin, and supplies a few facts in support of his theory. The large number of illustrations, from photographs, are especially interesting.

Marocco. *Questions Dipl. et Colon* **8** (1899): 321–331. **Kryszanowski.**

Le Maroc français. Par L. Kryszanowski.

The title applies, not to any existing French possession, but to the desirableness of increasing French interests in Marocco.

Niger—Navigation. ——

Renseignements Colon., Comité l'Afrique Française, No. 9 (1899): 174–178.

La navigation du Niger. Rapport sur la flottille du Soudan français.

Northern Rhodesia. *J. Tyneside G. S.* **4** (1900): 264–268. **Hepburn.**

A short account of a Trip to the Kafukwe River. By G. Hepburn.

Sahara—In-Salah. *Questions Dipl. et Colon.* **9** (1900): 65–69. **Bernard.**

L'occupation d'In-Salah. Par Prof. Augustin Bernard. *With Map.*

Sahara—In-Salah. *La G., B.S.G. Paris* (1900): 141–150. **Derrécagaix and Froidevaux.**

In-Salah. Par M. le Général Derrécagaix.

L'occupation d'In-Salah et ses conséquences géographiques. Par M. Henri Froidevaux.

South Africa. **Leclercq.**

A travers l'Afrique Australe. Voyage au Pays des Boers. Por Jules Leclercq. Deuxième Edition. Paris: E. Plon, Nourrit et Cie., 1900. Size 7½ × 5, pp. 336. *Map and Illustrations. Presented by the Author.*

An additional chapter on the history of the Boers is given in the present edition; there is also a larger map of South Africa.

South Africa. *Globus* **77** (1900): 21–24, 42–45. **Fritsch.**

Die Entstehung der südafrikanischen Freistaaten. Von Gustav Fritsch.

Sudan—Indiarubber. ——

Renseignements Colon., Comité l'Afrique Française, No. 9 (1899): 168–172.

Le caoutchouc du Soudan.

Transvaal. *Verh. Ges. Erdk. Berlin* **27** (1900): 60–73. **Schenck.**

Herr Dr. A. Schenck: Transvaal und Umgebungen.

NORTH AMERICA.

America. **Pector.**

Désiré Pector. Notes sur l'Americanisme. Quelques-unes de ses Lacunes en 1900. Préface du Dr. E.-T. Hamy. Paris: J. Maisonneuve, 1900. Size 11 × 7, pp. vi. and 242. *Price* 20*s.*

This book ranges over the whole of America, from the Arctic to the Antarctic regions, pointing out the gaps in our knowledge of each district, and thus serving to direct attention to explorations and researches which it is desirable to carry out.

Canada—British Columbia. **Hill-Tout.**

P. and T.R.S. Canada 4 (1898) (Sec. 2): 187–231.

Oceanic Origin of the Kwakiutl-Nootka and Salish Stocks of British Columbia and Fundamental Unity of Same, with Additional Notes on the Déné. By Charles Hill-Tout.

Canada—Quebec. *P. and T.R.S. Canada* 4 (1898) (Sec. 1): 139–216. **Gérin.**

L'Habitant de Saint-Justin. Contribution à la Géographie Sociale du Canada. Par M. Léon Gérin. *With Illustrations.*

A study of the social and economic life of a French Canadian village, giving insight into the relation between the people and their habitat.

Canada—St. Lawrence. *P. and T.R.S. Canada* 4 (1898) (Sec. 3): 3–30. **Keefer.**

Ice Floods and Winter Navigation of the Lower St. Lawrence. (Presidential Address of Section.) By T. C. Keefer, C.M.G. *With Plans and Illustrations.*

Canada—St. Lawrence. *P. and T.R.S. Canada* 4 (1898) (Sec. 2): 107–135. **Sulte.**

The Valley of the Grand River, 1600–1650. By Benjamin Sulte.

A portion of the history of the exploration of Canada, dealing with the opening up of the St. Lawrence valley.

Great Lakes. **Henry and Conger.**

U.S. Department of Agriculture, Weather Bureau. Meteorological Chart of the Great Lakes. Summary for the Season of 1899, vol. ii. No. 9. Prepared . . . by Alfred J. Henry and Norman B. Conger. Washington: Weather Bureau, 1899. Size 12½ × 10, pp. 28. *Charts.*

North America. *B.G.S. Philadelphia* 2 (1899): 55–69. **Russell.**

The Names of the Larger Geographical Features of North America. By Israel C. Russell. *With Map.*

The map is the photograph of a relief model of North America. The paper is referred to in the *Journal* for March, p. 283.

North America—Discovery. *P. and T.R.S. Canada* 4 (1898) (Sec. 2): 77–99. **Howley.**

Vinland Vindicated. By Right Rev. Bishop M. F. Howley. *With Map.*

The author adduces reasons for believing that Helluland was on the west coast of Newfoundland, Markland the Magdalen islands, and Vinland somewhere on the southern shore of the Gulf of St. Lawrence.

North America—Ornithology. **Cory.**

The Birds of Eastern North America. Part ii. Land Birds. Key to the Families and Species. By Charles B. Cory. Special Edition printed for the Field Columbian Museum, Chicago, Ill. 1899. Size 9½ × 7½, pp. x. and 131–387. *Illustrations.*

United States—California. **Bachmann and others.**

Ann. Hydrographie 27 (1899): 587–592.

Port Los Angeles. Nach Berichten der Kapitäne F. Bachmann, R. Mehring, F. Warneke, und C. Christensen. *With Plate.*

The plates show the pier at Los Angeles as it appears from the land and from the sea.

United States—California. *Sierra Club B.* 3 (1900): 109–111. **Jordan.**

The East Basin of Mount Brewer, or Ouzel Basin. By D. S. Jordan. *With Map.*

United States—California. *Sierra Club B.* 3 (1900): 1–107. **Le Conte.**

Ramblings through the High Sierra. (Reprinted from 'A Journal of Ramblings,' privately printed in 1875.) By Joseph Le Conte. *With Illustrations.*

United States—Idaho. *American J. Sci.* 9 (1900): 9–12. **Stone.**

Note on the Glaciation of Central Idaho. By George H. Stone.

United States—Idaho and Montana—Boundary. **Goode.**

National G. Mag. 11 (1900): 23–29.

The Idaho and Montana Boundary Line. By Richard U. Goode. *With Diagram and Illustration.*

A note on this paper appears in the *Journal* for April, p. 422.

United States—Iron Manufacture. *J. Franklin I.* 148 (1899): 437–461. **Fritz.**

The Development of Iron Manufacture in the United States in the Past Seventy-five Years. By John Fritz.

The production of pig-iron in the United States was 53,908 tons in 1810, first reached 1,000,000 tons in 1864, passed 5,000,000 in 1886, and reached 11,773,934 tons in 1898.

United States—New York. *B. American G.S.* 31 (1899): 417–443. **Tarr.**

Physical Geography of New York State. Part ix. The Shore Lines. By R. S. Tarr. *With Illustrations.*

CENTRAL AND SOUTH AMERICA.

Amazon. **Ballesteros.**

Sixto L. Ballesteros. A través del Amazonas. La Paz, 1899. Size 9 × 6, pp. iv. and 104. *Map. Presented by the Author.*

A journey from La Paz down the Rio Beni, Rio Madeira, and Amazon to Pará, executed in the years 1894–95.

Argentina—Locusts. ———

Comisión Central de Extinción de Langosta. Memoria de los trabajos realizados durante el 1er ejercicio con un informe especial de la inspección general, 1897–98. Buenos Aires, 1899. Size 10½ × 7½, pp. 240. *Maps. Presented by Dr. F. P. Moreno.*

On the effort made in the different provinces of the Argentine Republic to stamp out the locust pest. The maps show the position and direction of the locust swarms in each province for several distinct invasions.

Argentina—Pilcomaya River. *S. American Miss. Mag.* 34 (1900): 29–32. **Pride.**

The Ibareta Search Expedition.

Notes of the expedition under Sen. Uriarte in search of the missing explorer, Sen. Ibareta, on the upper Pilcomayo.

Bolivia. **Ballivian.**

La Estadistica de la Goma elástica en Bolivia. (Estudio preliminar.) Por M. V. Ballivian. La Paz, 1899. Size 9½ × 7, pp. 6. *Presented by the Author.*

Bolivia. **Kramer.**

Pedro Kramer. La Industria en Bolivia. (Primera Parte.) La Paz, 1899. Size 9 × 6, pp. 308. *Map. Presented by Don M. V. Ballivian.*

A study of the natural resources of Bolivia, and of the industries which exist in the country or which may be introduced advantageously.

Venezuela—Boundary. ———

Venezuela. Nos. 4, 5, 6 (1899). Venezuela-British Guiana Boundary Arbitration. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. (No. 4) 236, (No. 5) 118, (No. 6) 766 and lxxx. *Price,* (No. 4) 11½*d.*, (No. 5) 6*d.*, (No. 6) 3*s.* 5*d.*

West Indies. ———

West Indies. Further Correspondence relating to the Hurricane on 10th–12th September, 1898, and the Relief of Distress caused thereby. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. viii. and 96. *Price* 10*d.*

West Indies—Pilot. **Barnett.**

The West India Pilot. Vol. ii. The Caribbean Sea, from Barbados to Cuba; with Florida Strait, Bahama and Bermuda Islands. Originally compiled by Captain E. Barnett, R.N. Fifth Edition. London: J. D. Potter, 1899. Size 9½ × 6, pp. xx. and 686. *Index Chart. Price* 6*s.* *Presented by the Hydrographer, Admiralty.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Aborigines. **Magarey.**

P.R.G.S. Australasia (*S. Australia*) 3 (1899): 119–126.

Tracking by the Australian Aborigine. By A. T. Magarey.

Australia—Aborigines. *T.R.G.S. Australasia* (*Victoria*) 17 (1899): 52–63. **Walpole.**

Suggestions as to the Origin and Geographical Distribution of the Aborigines of Australia. By R. S. Walpole. *With Illustrations.*

The author brings forward reasons for his belief that the Australian Aboriginal is descended from the Dravidian tribes now represented in India by the Todas.

Australia—Camels. **Phillipson.**

P.R.G.S. Australasia (*S. Australia*) **3** (1899): 83–92.

Camels in Australia. By N. E. Phillipson, J.P.

On the introduction of the camel to Australia, and its value in desert travelling.

Australia—Water. **Magarey.**

P.R.G.S. Australasia (*S. Australia*) **3** (1899): 67–82.

Australian Aborigines' Water-Quest. By A. T. Magarey.

On the art of finding water in the arid desert, especially in the roots of "water-trees."

British Solomon Islands. **Woodford.**

British Solomon Islands. Report for 1898–99. Colonial Reports, Annual No. 275, 1899. Size 10 × 6, pp. 32. *Price* 2*d.*

Contains report of the journey in Guadalcamar summarized in the *Journal* for January, p. 71.

Paumotu Islands. *Globus* **77** (1900): 13. **Lamprecht.**

Der Name der Paumotu-Inseln. Von G. Lamprecht.

Samoa. *Beiträge Kolonialpolitik u. Kolonialwirtschaft* (1899): 7–12. **Kusserow.**

Zur Samoa-Frage. Von H. v. Kusserow.

South Australia. *T.R.S. South Australia* **23** (1899): 198–207. **Howchin.**

Notes on the Geology of Kangaroo Island, with special reference to Evidences of Extinct Glacial Action. By Walter Howchin. *With Plan and Section.*

South Australia—Tides. **Chapman and Inglis.**

P.R.G.S. Australasia: *S. Australian Br.* **3** (1899): 93–102.

The Tides of South Australia. By R. W. Chapman, M.A., and Captain Inglis.

Tasmania. **Murray.**

Tasmanian Rivers, Lakes, and Flowers. By A. S. Murray. With Facsimile Reproductions in Colour of numerous Sketches by the Author. Australia: G. Robertson & Co.; London: H. Virtue & Co. 1900. Size 13 × 18, pp. 58. *Presented by the Publishers.*

Striking pictures of the varied scenery of Tasmania, finely printed in colours.

Tasmania—Hobart. *B.S.G. Marseille* **23** (1899): 257–274. **Bourge.**

Les ports d'Australie: Hobart. Par M. Georges Bourge.

Western Australia. ———

The Golden West. Her Mines and Industries, 1899, as represented at the Coolgardie Exhibition. Published by authority of the West Australian Government. Size 17 × 11, pp. 68. *Illustrations.*

Western Australia. ———

Western Australia. Annual Progress Report of the Geological Survey for the year 1898. Perth, 1899. Size 13½ × 8½, pp. 64. *Maps. Presented by the Government of Western Australia.*

Western Australia. **Wells.**

P.R.G.S. Australasia: *S. Australian Br.* **3** (1899): 149–171.

Abstract of Journal of Explorations in Western Australia, 1896–7, under command of L. H. Wells.

POLAR REGIONS.

Antarctic. **Arctowski.**

Rapport préliminaire sur les recherches océanographiques de l'expédition antarctique belge. Par Henryk Arctowski. (Extrait des *Bull. de l'Acad. roy. de Belgique* (Classe des Sciences), No. 11, pp. 642–649. 1899.) Size 8½ × 6. *Plates. Presented by the Author.*

Antarctic. *Petermanns M.* **45** (1899): 283–285. **Supan.**

Die erste meteorologische Jahresreihe aus dem Südpolargebiete. Von Prof. Dr. A. Supan.

Summary and discussion of M. Arctowski's paper in the *Geographical Journal*, vol xiv., p. 413.

Arctic—Andrée Expedition. *Ymer* **19** (1899): 409–443. **Nathorst and Lagerheim.**

Undersökningar beträffande den på Kung Karls land funna stora flytbojen från

Andrée-expeditionen. 1. Den Andréeska polarbojens drift till Kung Karls land. Af A. G. Nathorst. 2. Fyndomständigheter, bojens identifiering, tekniska undersökningar, etc. 3. Om växt- och djurlämningarna i Andrée's polarboj. Af G. Lagerheim. *With Map and Illustrations.*

Full particulars regarding the discovery of the "polar-buoy" of the Andrée expedition, and on the seaweeds with which it was covered.

MATHEMATICAL GEOGRAPHY.

Geodesy. *P. and T.R.S. Canada* **4** (1898) (Sec. 3): 31–37. **Pritchett.**

A Plan for International Measurement of an Arc of the 98th Meridian. By Dr. Henry S. Pritchett. *With Maps.*

Plan for the measurement of an arc of the meridian of 98° W. from 15° N. to 70°, to be undertaken jointly by Mexico, the United States, and Canada.

Latitude Changes. *C. Rd.* **130** (1900): 307–309. **Boccardi.**

Étude sur la variation de la latitude à l'observatoire de Teramo (Italie). Note de M. Jean Boccardi.

Latitude Changes. *B.A.R. Belgique* **36** (1898): 276–281. **Folie.**

Fondements de la théorie de la variation des latitudes. Par F. Folie.

Latitude Changes. *Sitzb. A.W. Wien* **107**, Abth. II.a. (1898): 507–514. **Grabowski.**

Einige Bemerkungen zur Erklärung der Polbewegung. Von L. Grabowski. *With Diagram.*

Longitude. *Nautical Mag.* **69** (1900): 98–104. **White.**

Longitude by Eclipses. By J. Dundas White.

Navigation. *Ann. Hydrographie* **28** (1900): 24–28. **Reuter.**

Zur Berechnung der Breiten- und Längenberichtigung nach der Standlinienmethode. Von W. Reuter.

Navigational Instrument. *Rev. Maritime* **143** (1899): 56–60. **Decante.**

Cercle équatorial de relèvement. Par M. E. Decante.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climate. *Ymer* **19** (1899): 353–403. **Ekholm.**

Om Klimatets ändringar i geologisk och historisk tid samt deras orsaker. Af Nils Ekholm. *With Map.*

On climate-changes and their probable cause.

Geophysics. *B.A.R. Belgique* **35** (1898): 169–172. **Folie.**

Théorie du mouvement de rotation de l'écorce solide du globe. Fondements de l'astronomie sphérique au XX^e^ siècle. Par F. Folie.

On the interaction between the solid crust and the inner nucleus of the Earth.

Geophysics. *Scottish G. Mag.* **16** (1900): 60–67. **Geikie.**

A White-hot Liquid Earth and Geological Time. By Prof. James Geikie.

A *résumé* of Prof. Chamberlin's criticism of Lord Kelvin's theory as to the origin and age of the Earth, pointing out that the assumption of the globe having cooled from a white-hot liquid mass is not necessary, but that the Earth might have been built up as a solid body *ab initio* by the slow accretion of meteoric masses.

Glacial Periods. *J. Geology* **7** (1899): 751–787. **Chamberlin.**

An attempt to frame a working hypothesis of the cause of Glacial Periods on an atmospheric basis. III. By T. C. Chamberlin. *With Charts. Also separate copy.*

Mountain Lines. *Rev. Scientifique* **13** (1900): 143–148. **Souleyre.**

Les directions conjuguées des plissements et fractures de l'écorce terrestre. Par M. A. Souleyre.

The author first shows the frequent occurrence of two systems of crust-folds, one at right angles to the other, which he terms conjugated systems; then points out that the two members of a conjugated system are not synchronous, but are associated with igneous rocks of different age; he then finds it necessary to this theory that the movements of the crust should correspond with sunspot periods, and thus it should be possible to predict earthquakes.

Seismology. *Science* **11** (1900): 215–218. **Tucker.**

The Effect of the Mexican Earthquake of January 19, at Mount Hamilton, California. By Prof. R. Tucker.

This records the discovery of an earthquake shock by means of a meridian circle.

Terrestrial Magnetism. *Mém. A.R. Belgique* **53, 2** (1898): 1–40. **Lagrange.**

Magnétisme terrestre. La déclinaison d'une boussole, libre et à l'état statique, est-elle indépendante de son moment magnétique? Observations de déclinomètres à moments différents. Par Charles Lagrange. *With Diagrams.*

Terrestrial Magnetism. *Sitzb. A.W. Wien* **107** Abth. II. a. (1898): 753–776. **Liznar.**

Ueber die Aenderung der erdmagnetischen Kraft mit der Höhe. Von Prof. J. Liznar.

Terrestrial Magnetism. *Terrestrial Magnetism* **4** (1899): 237–239. **Tillo.**

Sur la Rélation qui existe entre la Répartition des Éléments Magnétiques et la Distribution Générale des Mers et de la Température Moyenne Annuelle à la Surface du Globe. Note de M. le Lieutenant Général Alexis de Tillo.

Volcanoes. **Grosser.**

Die Ergebnisse von Dr. Alphons Stübels Vulkanforschungen. Von Paul Grosser. Schöneberg: Berlin, 1900. Size 10½ × 7½, pp. 14. *Presented by the Author.*

A discussion of the results of Dr. Stübel's study of the volcanoes of Ecuador in their bearing on the theory of volcanic action, and especially as regards the doubt they throw on the wide applicability of Suess's rift theory of volcanoes.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Colonization. **Haulleville.**

Alphonse de Haulleville. La Morale de la Colonisation. Deuxième édition. Paris: A. Challamel, 1900. Size 10 × 6½, pp. 44.

Colonization. **Ireland.**

Tropical Colonization. An introduction to the Study of the Subject. By Alleyne Ireland. New York: the Macmillan Company. London: Macmillan & Co., 1899. Size 9 × 6, pp. xii. and 282. *Diagrams.*

The author has had experience for several years in British tropical possessions in Asia and America, and now puts together the results for the benefit of the United States public, to enable them to form opinions as to the best way of governing a tropical colony, how to obtain a trustworthy labour supply, and to understand what the possession of tropical colonies amounts to from the standpoint of the sovereign state.

BIOGRAPHY.

Dawson. *J. Geology* **7** (1899): 727–736. **Adams.**

Sir William Dawson. By Frank D. Adams.

General. **Viterbo.**

Trabalhos Nauticos dos Portuguezes nos seculos xvi. e xvii. Parte ii. Constructores Navaes. Memoria apresentada á Academia Real das Sciencias por occasião da celebração do 4º Centenario do Descobrimento do caminho maritimo da India. Por Sousa Viterbo. Lisboa, 1900. Size 12 × 9, pp. 300. *Frontispiece. Presented by the Author.*

A biographical dictionary of 124 Portuguese shipbuilders of the sixteenth and seventeenth centuries.

Münster. **Hantzsch.**

Sebastian Münster, Leben, Werk, Wissenschaftliche Bedeutung. Von Viktor Hantzsch. (Des XVIII. Bandes der Abhandlungen der philologisch-historischen Classe der Königl. Sächsischen Gesellschaft der Wissenschaften. No. III.) Leipzig: B. G. Teubner, 1898. Size 11½ × 8, pp. 188.

Sebastian Münster was the compiler of one of the earliest geographical text-books published in the sixteenth century.

Smithson. *J. Tyneside G.S.* **4** (1900): 229–230. ——

The Late Mr. G. E. T. Smithson. *With Portrait.*

Wild. *Terrestrial Magnetism* **4** (1899): 273. ——

Professor Heinrich Wild.

GENERAL.

Geographical Congress. Claparède.

Souvenirs du VII^e^ Congrès International de Géographie, Berlin, 1899. Par Arthur de Claparède. Genève, 1899. Size 7½ × 5, pp. 52. *Presented by the Author.*

A very animated description of the proceedings of the Seventh International Geographical Congress.

Geographical Congress. *B.S.G. Madrid* **41** (1899): 249–282. Lluesma.

El Congreso internacional de Geografía de Berlin. Reseña de sus tareas, por el Secretario de la Sociedad Geográfica de Madrid. Don Eusebio Jiménez Lluesma.

Geographical Congress. *B.S.G. Italiana* **1** (1900): 9–52. **Vedova, Agostini, Viezzoli.**

Il settimo Congresso Internazionale a Berlino, relazione dei Socî Delegati della Società Geografica Italiana Prof. G. Dalla Vedova, dott. G. De Agostini, Prof. F. Viezzoli.

Geography. *B. Union G. Nord de la France* **20** (1899): 32–45. Conrad.

La Géographie et la Science. Par H. Conrad.

Geography. *G.Z.* **6** (1900): 65–89. Günther.

Der Humanismus in seinem Einflusse auf die Entwicklung der Erdkunde. Von Prof. Dr. S. Günther.

Geography. Wagner.

Lehrbuch der Geographie, von Hermann Wagner. Sechste . . . Auflage von Guthe-Wagner's Lehrbuch der Geographie. Erster Band. Einleitung. Allgemeine Erdkunde. Hannover und Leipzig: Hahn'sche Buchhandlung, 1900. Size 9½ × 6½, pp. xvi. and 882. *Presented by the Author.*

A monumental work passing in review every department of the science of geography.

Health in Tropics. *G.Z.* **5** (1899): 671–678. Däubler.

Ueber die Berechtigung der Anlage von Höhensanatorien in den Tropen, auch mit Rücksicht auf die neuesten Ergebnisse der Malariaforschung. Von Dr. C. Däubler.

On the question of the best situation for sanatoria on the mountains of tropical countries, with special reference to the avoidance of malaria.

Mountains. Lendenfeld.

Die Hochgebirge der Erde. Von Robert von Lendenfeld. Freiburg im Breisgau, Herdersche Verlagshandlung, 1899. Size 9½ × 6½, pp. xiv. and 532. *Maps and Illustrations.*

Chapters on the origin, structure, and arrangement of mountains and mountain chains and on mountain floras lead to a general account of each of the great mountain chains of the world, with numerous illustrations and maps.

Paradox. Andrews.

The Diuturnal Theory of the Earth; or, Nature's System of Constructing a Stratified Physical World. By William Andrews. New York: M. Andrews & E. G. Stevens; London: Low & Co. 1899. Size 8 × 6, pp. xxiv. and 552. *Portrait and Maps. Price* 12*s.* 6*d. Presented by Messrs. Low & Co.*

The author of this curious speculation was a man of considerable ability. Born in Philadelphia in 1798, he was a drummer in the war of 1812, and became in turn a bookbinder, journalist, and stationer; but he found time to collect an immense number of geological specimens, and to elaborate the theory described in this volume. He had the self-control to publish nothing, and died in 1887. His executors claim that he takes his place "beside Copernicus, Galileo, Newton, and Darwin." Diuturnal revolution is described as a sort of spiral revolution of the Earth, in the course of which "the north terrestrial polar point is taken within 30° of the south sidereal polar point, and returned to within 60° of the point under the North Star, from whence it started."

Place-names—America. *Deutsche Rundschau G.* **22** (1900): 193–202. Schiller-Tietz.

Woher stammt der Name "Amerika?" Von Schiller-Tietz.

A summary of the controversy as to the origin of the name "America," now set at rest by the definite proof that Waldseemüller introduced the word as derived from the name of Amerigo Vespucci.

Regional Geography. *B. Union G. Nord de la France* **20** (1899): 27–31. Ardaillon.

Programme d'études de géographie régionale. Par M. E. Ardaillon.

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By J. COLES, *Map Curator*, R.G.S.

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ASIA.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, Quarter-sheets, 4 miles to an inch. No. 66 S.W., parts of districts Bijnor, Almora, Naini Tal and Garhwál, and Native State of Tehri Garhwál (N.W.

Provinces), additions to 1899; 76 N.E., parts of districts Karnal, Nellore, and Kistna (Madras Presidency), 1898; 77 N.W., parts of districts Karnal, Anantapur, Cuddapah, and Nellore (Madras Presidency), 1899.—Skeleton Map of India, 64 miles to an inch. 1899. 2 sheets.—Assam, 48 miles to an inch. 2nd edition, 1899.—Punjab and surrounding countries, skeleton map, 32 miles to an inch. Additions and corrections to 1899.—Sind Survey, 1 mile to an inch. No. 33, district Karachi, Season 1894–97; 77A, part of Kalát (Baluchistán) and district Dera Gházi Khán (Punjab), Season 1897–98; 87 (Preliminary issue), districts Hyderabad and Thar and Párkar, Season 1896–97.—Central India and Rajputána Survey, 1 mile to an inch. No. 474, parts of district Mirzapur (N.W. Provinces), and Native State of Rewah (C.I. Agency), Seasons 1864–65, 1881–82, and 1883.—South Eastern Frontier, 4 miles to an inch. No. 5 S.W. (6th edit.), Seasons 1886–92.—Upper Burma, 16 miles to an inch. 2 sheets (2nd edit.).—District Darbhanga, Seasons 1846–49, 4 miles to an inch. Corrections to 1899.—His Highness the Nizam's Dominions, including the Assigned Districts of Berar, 16 miles to an inch. 2 sheets. Additions and corrections to 1898.—Hill Tippera, Bengal, 8 miles to an inch. Corrections to 1899.—District Rohtak, Punjab, 8 miles to an inch. 1899.—Chart of Triangulation and Traverse. No. 12, Party (Sind), 2 miles to an inch. Sheets 77 and 77A, parts of Kalát (Baluchistán); Nos. 86, 87, 88, 106 (Sind), Seasons 1896–98.—Assam, Index Map showing scales of publication. 1899.—Conventional signs for Cadastral Maps.—*Presented by H.M. Secretary of State for India, through the India Office.*

AFRICA.

South Africa. **Wood and Ortlepp.**

Map of the Orange Free State, southern part of the Transvaal, Natal, Basutoland, and the adjacent parts of Cape Colony. Scale 1: 1,267,200 or 20 stat. miles to an inch. Wood and Ortlepp, Cape Town and Johannesburg. London: E. Stanford.

This map will be useful for reference in following the movements of troops in South Africa. It embraces the whole of the Orange Free State, Natal, the southern part of the Transvaal, Basutoland, and the adjacent parts of the Cape Colony. Inset plans are given on enlarged scales of Pretoria, Johannesburg, Bloemfontein, Kimberley, Mafeking, Ladysmith, Dundee, and a small general map of South Africa. Although more names of places are given than is usual on maps of this scale, they are clearly written, and do not give the map the appearance of being overcrowded. Railways are printed in black, roads in red, and hills in brown.

GENERAL.

World. **Dickinson and Andrews.**

The "Diagram" Series of Coloured Hand Maps. Designed by B. B. Dickinson, M.A., F.R.G.S., and A. W. Andrews, M.A., F.R.G.S. London: George Philip & Son. *Price* 1*d. each. Presented by Messrs. Dickinson and Andrews.*

This series of orographically coloured maps, of which the following is a list, should prove useful in schools. Names of places are purposely omitted, but spots indicating the positions of the principal places are shown. As the maps have been carefully compiled, and can be purchased for one penny each, they will no doubt soon come into general use for the purposes of geographical instruction. The following is a list of the maps:—

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World. **Ilyin.**

Two charts of the world showing Isobars and Wind for January and February, and June and July. A. Ilyin, St. Petersburg. (In Russian characters.) *Presented by the Publisher.*

World. **Vivien de Saint Martin and Schrader.**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librairie Hachette et Cie. Sheets: Europe Centrale, Inde Méridionale. *Price* 2 *fr.* each. *Presented by the Publishers.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

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1339 North coast of Upolo.	New chart. North coast of Upolo	1339

Charts that have received Important Corrections.

No. 2929, Atlantic ocean :—Currents. 1188, The World :—Coal and Telegraph chart. 240, England, south coast :—Hamoaze. 62B, Channel islands :—Jersey. 2273, White sea, Sheet v. 2274, White sea, Sheet vi. 2353, France, west coast :—Rade de Croisic to Presqu'île de Quiberon. 1131, Island of Corsica. 2802, Greece, east coast :—Euripo town and strait. 2232, Black sea :—Odessa to Sevastopol. 1774, Falkland islands :—Stanley harbour. 2818, United States, east coast :—Hampton roads and Elizabeth river. 2044, Brazil :—Ilha Grande and Sapetiba bays. 2531, United States, west coast :—Cape Mendocino to Vancouver island. 1917, Vancouver island. 2689, British Columbia :—Haro and Rosario straits. 643, Africa, south coast :—Port Natal. 685, Africa, east coast :—Bazaruto bay. Limpopo river. 253, Gulf of Aden :—Jebel Jan to Shab Kulangarit. 2403, Singapore strait. 934, Eastern archipelago :—Surabaya, Bali, and Sapudi straits. 947, Borneo :—Victoria harbour. 214, Solomon islands. 2637, Strait of Makassar, south part. 2662, Eastern archipelago :—Ports in Makassar strait. 2562, China :—Canton river. 166, China :—Pagoda anchorage and approaches. 452, Japan :—Yezo island. 996, Japan :—Kii channel to Yedo. 1016, Australia, south coast :—Corner inlet to Gabo island. 2054, New Zealand :—Cook strait and coast to Cape Egmont. 2535, New Zealand :—Manukau harbour to Cape Egmont. 1469, Solomon islands :—Guadalcanar and Florida islands. 2658, Solomon islands :—Gavutu and Tulagi harbours. 1378, Sandwich islands :—Honolulu harbour.

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United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for March and April, 1900, and North Atlantic Ocean for March, 1900. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Andorra. **Southam.**

Four Photographs of Andorra (enlargements), by S. C. Southam, Esq., F.S.A. *Presented by S. C. Southam, Esq.*

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Armenia. **Maunsell.**

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Central Asia. **Deasy and Pike.**

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By far the greater number of this valuable set of photographs were taken by Captain H. H. P. Deasy during his explorations in Central Asia; the remainder are by Mr. Arnold Pike, who accompanied him. Considering the difficult circumstances under which many of them were taken, they are remarkably good specimens of photography, and the subjects are well chosen to convey an excellent idea of the country Captain Deasy surveyed and the natives with whom he came in contact.

(1) Street scene near Kashgar; (2) Bazar in Kashgar; (3) Yarkand women; (4) Scene in valley of Yarkand river near Kosarab; (5) Looking down the Yarkand river from Bu Kujerab; (6) General view of Tir; (7) Yarkand women; (8) Upper part of Mariong valley; (9) Captain Deasy in native dress; (10) Mr. R. P. Cobbold riding a yak; (11) Looking down the Yarkand river from the mouth of the Mariong river; (12) Bivouac at Tarim Boko; (13) Valley of Yarkard river near Kosarab; (14) Valley of the Yarkand river from mouth of Miskan Jilga; (15) The Amban of Yarkand; (16) Bazar in Kashgar; (17) The Amban of Yarkand; (18) Looking up the Yarkand river from mouth of Mariong river; (19) Wall of Yangi Shahr, Yarkand; (20) General view of Yarkand river; (21) Family returning from market; (22) Street scene near Kashgar; (23) From Yetim Kozai pass looking towards Mariong; (24) Marpa, or native cart; (25) Bazar in Kashgar; (26) Snow-mountains near sources of Kiria river; (27) General view of Khandar range; (28) Scene in Polu Gorge; (29) Rest-house in Takla Makan desert; (30) Islam Akum; (31) View from near Gombaz; (32) Kara Saimen loading up near Shor Kul; (33) Ruins at Baba Hatum; (34) Large glacier near Nabo La; (35) Nurbu and the baggage sheep at camp No. 45; (36) Scene in Changchenmo; (37) Camp near top of Kepsung pass; (38) Camp scene in Tibet; (39) Captain Deasy interviewing Tibetans; (40) Camp at Rimdi; (41) On the march to Leh; (42) Kepsang pass from the west; (43) Sub-surveyor "S.-D"; (44) Headman of Gerche and natives; (45) Tibetan tent; (46) Scene at camp No. 71; (47) View of Himis monastery; (48) Scene at Rimdi; (49) Examining Tibetan; (50) Camp scene in Tibet; (51) Remnants of caravan returning to Ladak; (52) Caravan leaving Leh; (53) Near view of Leh; (54) Scene in Polu gorge; (55) Chag Zot of Himis monastery; (56) Entrance to Himis monastery; (57) Dead yak near Yeshil Kul; (58) Bleak scene near the An La; (59) Tibetan visitor; (60) General view of Leh; (61) Snow

bridge near Dras; (62) Camp scene in Tibet; (63) Coolies on the march in Kashmir; (64) Scene at camp No. 45; (65) Scene in Scinde valley; (66) Some of our Tibetan escort; (67) View between Sonamarg and Baltal; (68) Native boat, Srinagar; (69) Reading barometer at Pangkong Lake; (70) Distant view of Mangtza Cho; (71) Cairn near camp No. 33; (72) Tibetan woman; (73) Looking towards Ladak from camp No. 82; (74) Pike issuing rations, camp No. 69; (75) Mane and Chorten near Himis monastery; (76) Interior of Himis monastery; (77) Scene in camp No. 43; (78) Scene in Asgan Sal valley; (79) Dinner to my friends at Polu; (80) End view of peculiar formation near Ta Agzi in the Asgan Sal valley; (81) Bad part of track in Polu gorge; (82) From near Gambaz looking towards the Pichanyart pass; (83) Takla Makan desert near Kara Tarbaz; (84) Peculiar formation near Ta Agzi in the Asgan Sal valley; (85) Scene in Polu gorge; (86) View of Khandar range from near Khurak; (87) View of Kuen Lun range from near Shorkul; (88) Hill station near Kilik pass; (89) Camp at Gombaz; (90) From near Gombaz looking towards Raskam; (91) Fording the Kiria river near Baba Hatum; (92) Looking towards camp No. 91 from east branch of the Kiria river; (93) Loading up at Alajoi; (94) Baggage camels at Langar; (95) Marpas at Yarkand; (96) View of Taghdumbash Pamir from near Kuktaruk; (97) Kuen Lun range from near Shor Kul; (98) Looking up the Yarkand river from near Kosarab; (99) Part of track between Atabad and Gulmit; (100) Small lake west of Hopea or Gurmen Cho; (101) Distant view of Rakapushi; (102) General view of Baltit; (103) Altit from near Baltit; (104) Captain MacMahon presenting Chitral medals to Hunza levies on polo-ground at Baltit; (105) View of Kilik pass; (106) Steep ascent near Sandal Dawan; (107) Nasty corner on road to Pamirs; (108) View from Shiran Maidan; (109) Looking towards Kilik pass from near Kirktaruk; (110) Summit of Sandal Dawan (111) Group of Tajiks at Mazar Sultan; (112) Looking east from Gilgit; (113) Scene between Atabad and Gulmit; (114) Looking up the Dozok Dara Su from Bazar Dara; (115) Captain A. H. MacMahon, with his dog; (116) General view of Sandal Dawan; (117) Bivouac near Sandal Dawan; (118) Looking up the Taghdumbash Pamir; (119) Scene in Hunza valley; (120) Captain MacMahon holding a Durbar on the road to Baltit; (121) Scene in Raskam from Uruk; (122) Group of natives at Gulmit; (123) General view of Hunza valley from near Nilt; (124) Scene in Tibet; (125) Near view of Durbar; (126) Caravan crossing Bator glacier; (127) The Chag Zot of Himis monastery; (128) Stony camp near Kuktaruk; (129) Camp scene in Tibet; (130) Bator glacier; (131) Humayun Beg, Wazir of Hunza; (132) Camp near Khunjerab pass; (133) Part of track between Atabad and Gulmit; (134) Yepal Ungur with Kiria river; (135) Snow-mountains near sources of the Kiria river; (136) Nagar hawkers; (137) Camp scene in Tibet; (138) Looking towards crown of Dirran peak from Baltit; (139) Camp in Gilgit; (140) Group of Astor pony-men at Lob jungle; (141) View of Baltit looking towards the Pamirs; (142) Scene in Tibet; (143) Nasty place for camels in valley of Yarkand river; (144) View of Horna, or Grmen Cho.

Nigeria. **Clive.**

Four Photographs of Nigeria taken by Captain Clive on his journey from the Benue river. *Presented by Captain Clive.*

The following is a list of the titles:—

(1) King of Pali, wearing cap of chain mail; (2) King of Pali and followers; (3) King of Pali in court of his palace; (4) Steel canoe in which Captain Clive travelled up the Benué.

Patagonian Andes. **Steffen.**

One hundred and three Photographs taken in the neighbourhood of the Patagonian Andes, by Dr. Hans Steffen (Chilo-Argentine Boundary Commission). *Presented by Dr. Hans Steffen.*

These photographs form a valuable addition to the Society's collection.

(1) River Cisnes and Mount Pyramide; (2) Lake Nicolas, source of river Futaleufu; (3) Wooded gorge of river Mañiuales; (4) Lake Barros Arana; (5) Valley of river Futaleufu and Cordillera on its western side; (6) Mount Mechai, in the Puelo valley; (7) Puelo valley and Cordilleras from Mount Pelado; (8) Lower Mañiuales valley; (9) Forest near river Mañiuales; (10) Forest in the Mañiuales valley; (11) Upper Mañiuales valley and Mount Estatuas; (12) Rapid in the narrows of Mañiuales river; (13) Corcovado river; (14) Rapid of river Mañiuales; (15) Eastern extremity of the "raulé" woods near the sources of river Pico; (16) Cholila valley; (17) Scenery in the narrows of Mañiuales valley; (18) Cholila valley; (19) Summits of Mount Tronador and the Peulla glaciers; (20) Mount Techado; (21) Volcano Osorno;

(22) Valle Nuevo; (23) River Chubut; (24) Maniu forest, on both sides of river Mañiuales; (25) Lake Todos los Santos; (26) Lower Corcovado river; (27) River Chubut in the Maiten valley; (28) Valley of river Lenca; (29) Upper Manso valley; (30) Burned wood and "Magui" shrubbery in the narrows of the Puelo valley; (31) Settler's house, Valle Nuevo; (32) Narrows of river Puelo; (33) First big rapid of the Aisen river; (34) Mount Tronador and the Puelo glaciers; (35) Valley of the upper river Futaleufu; (36) Port Tangbac in the Chonos archipelago; (37) Destroyed mani wood in the Mañiuales valley; (38) Rocky narrows in the Mañiuales valley; (39) River Cisnes and Mount Pyramide; (40) River Aisen near its mouth and Mount Maca; (41) The "Boquete" parting the waters between the Puelo and Chubut basins; (42) Rapid, river Aisen; (43) The "Boquete" parting the waters between the Puelo and Chubut basins; (44) Snowy range, bordering Valle Nuevo; (45) Forest in the Central Cisnes valley; (46) Remains of an ancient settlement in Port Tangbac; (47) Rapid and narrows, river Manso; (48) Upper Mañiuales valley; (49) Water-parting region between rivers Cisnes and Apulen; (50) River Puelo in its lower course, and Mount Yate; (51) River Correntoso; (52) Torrentes valley; (53) Junction of rivers Simpson and Mañiuales, and Flores island; (54) Lake Totoral and Puelo valley; (55) Rapid in river Cisnes; (56) Lake Jorje; (57) Glacier-covered range dividing the waters between Lake Fontana and river Mañiuales; (58) Lower valley of the river Manso; (59) The "Porton," upper Mañiuales valley; (60) Lower valley of river Cisnes; (61) Western entrance to the narrows of river Cisnes; (62) River terraces, upper Cisnes valley; (63) Cedro wood, Puelo valley; (64) River Tictoc; (65) Water-dividing region between rivers Pico and Chergue; (66) Outlet of Lake Puelo; (67) Lower valley of river Aisen; (68) River terraces, Cisnes valley; (69) Scenery of a Sub-Andine valley; (70) Destroyed maniu wood, covering the bed of the Mañiuales river; (71) The Estancia Maiten; (72) Maiten valley and the Cordillera ranges; (73) Cedro wood in the Puelo valley; (74) Water-parting range between rivers Pulena and Ninehuan; (75) River Fenix flowing into Lake Buenos Aires; (76) Scenery bordering river Manso; (77) Marching in the Nuevo valley; (78) Valley of river Futaleufu; (79) Largo Maiten tree, Valley Nuevo; (80) Water-dividing region between rivers Pico and Chergue; (81) The "Morro," Cisnes valley; (82) Volcano Osorno; (83) Lower valley of river Cisnes; (84) Corral of Puelo valley, with terraces of former river-levels; (85) Mount Cáceres; (86) Port Carter, mouth of the river Cisnes; (87) Puelo valley and Cordilleras, from Mount Observacion; (88) Crossing river Cisnes on a raft; (89) Water-parting gap in the Caquel range between the rivers Teka and Corintos; (90) Water-dividing region between rivers Pico and Chergue; (91) Western entrance to the river Puelo narrows; (92) Lana Cáceres; (93) Rapid, lower Cisnes river; (94) A lagoon in the Mañiuales valley; (95) River terraces in Cisnes valley; (96) Water-parting region between rivers Cisnes and Shamon; (97) River Belgrano; (98) Cañon-like formation of the Mañiuales valley; (99) Corcorado river; (100) Affluent of river Cisces; (101) Upper Mañiuales valley; (102) South border of the great basaltic tableland, seen from Sillo valley; (103) Western extremity of the upper Puelo lakes.

Upper Nile. **Stanton**

Nine photographs of the Upper Nile above Fashoda, showing "Sudd," and three of natives, by Major E. A. Stanton. *Presented by Major E. A. Stanton.*

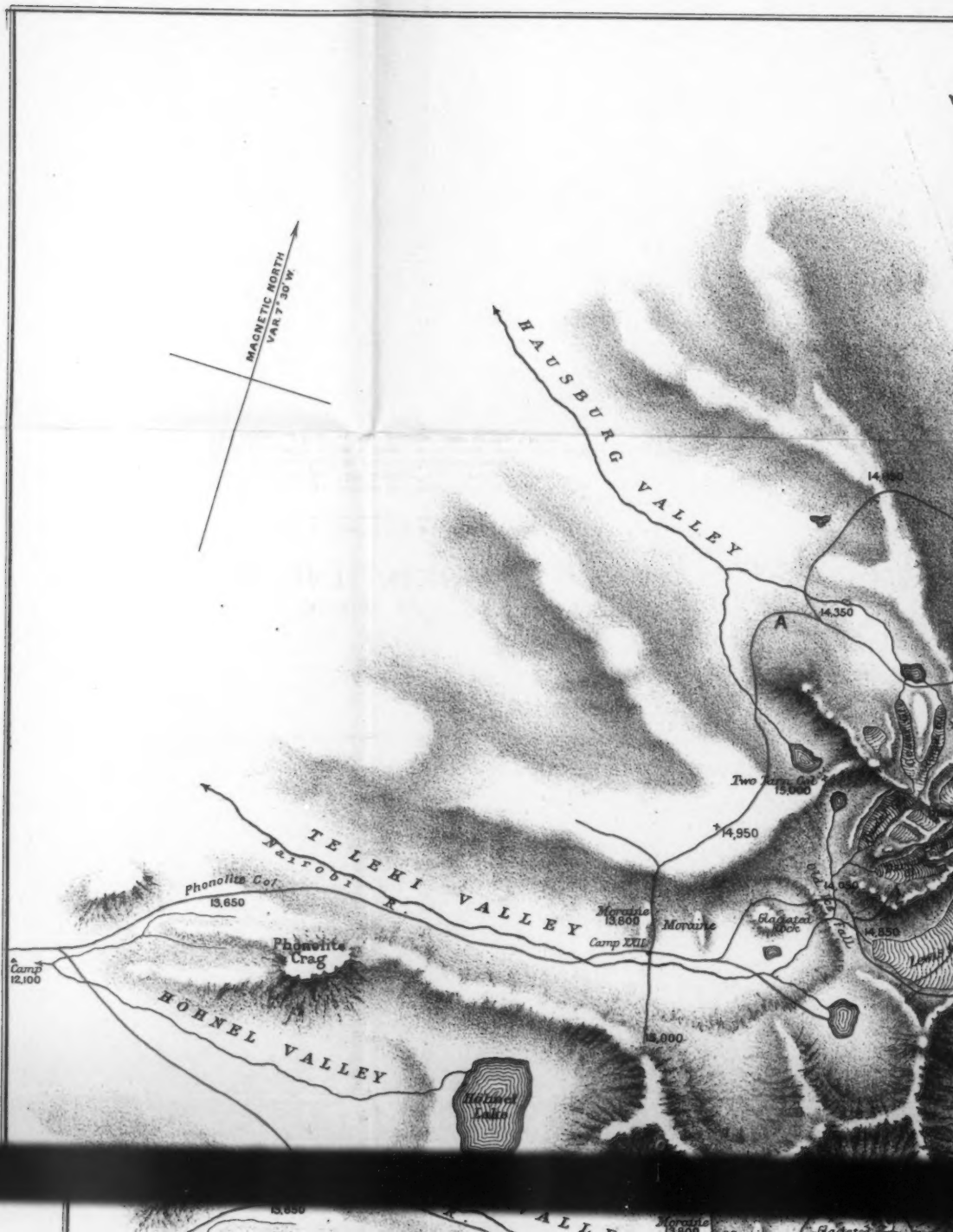
This interesting set of photographs shows, principally, the sudd on the upper Nile and its tributaries; in addition to which there are photographs of natives and their dwellings. The following is a list of their titles:—

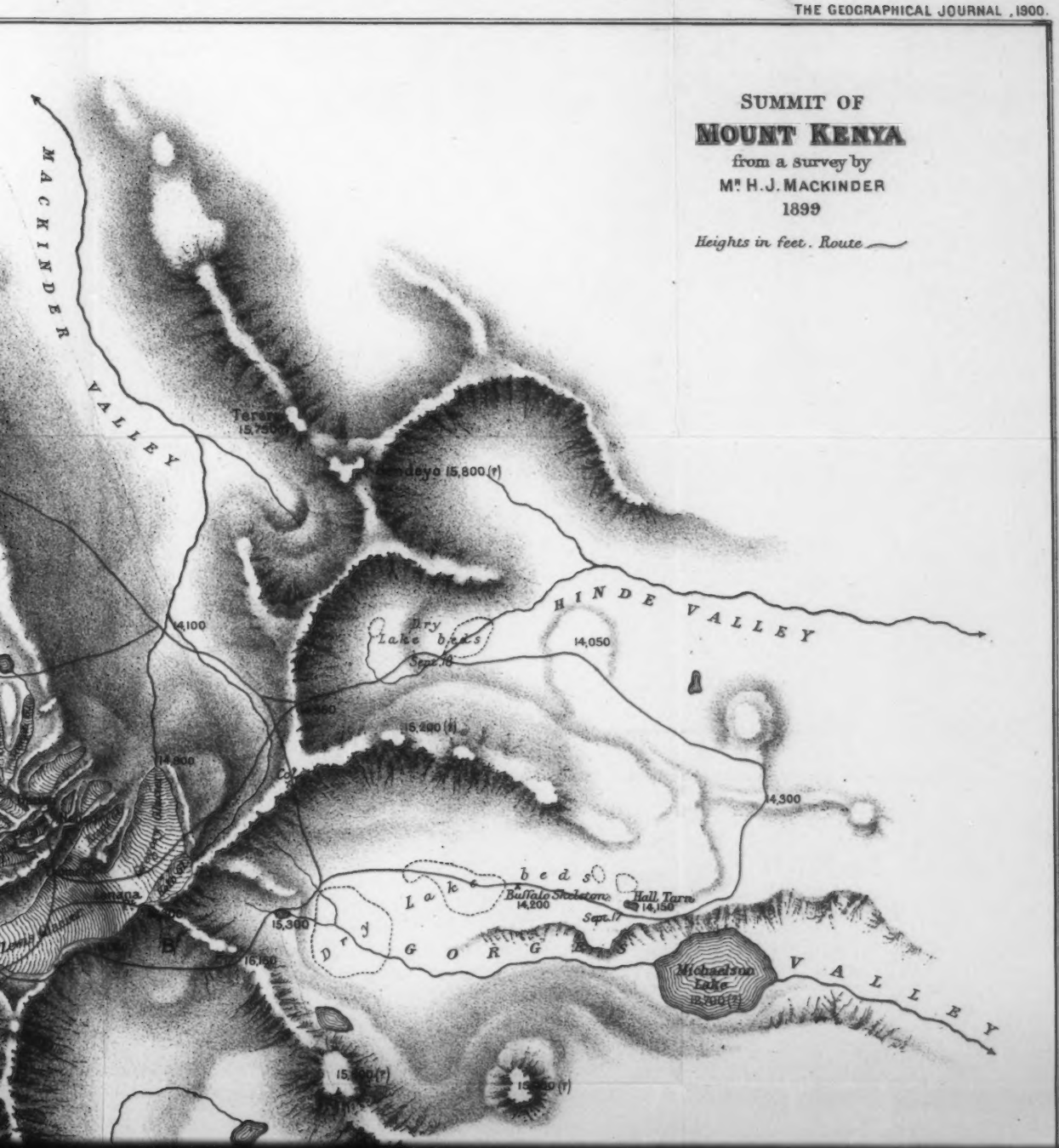
(1) Sudd coming down the White Nile near Lake No; (2) Sudd islands drifting down stream; (3) White Nile near Sobat: drifting sudd; (4) Wind breaking pieces of sudd; (5) Composition of the sudd on the Bahr ez Zeraf; (6) Denka war-dance; (7) Camp on White Nile, 25 miles north of Fashoda; (8) On the banks of the Bahr ez Zeraf; (9) Lake No and sudd coming out of Bahr el Ghazal; (10) Piece of sudd being broken up; (11) A Denka man; (12) Shieluks at Fashoda.

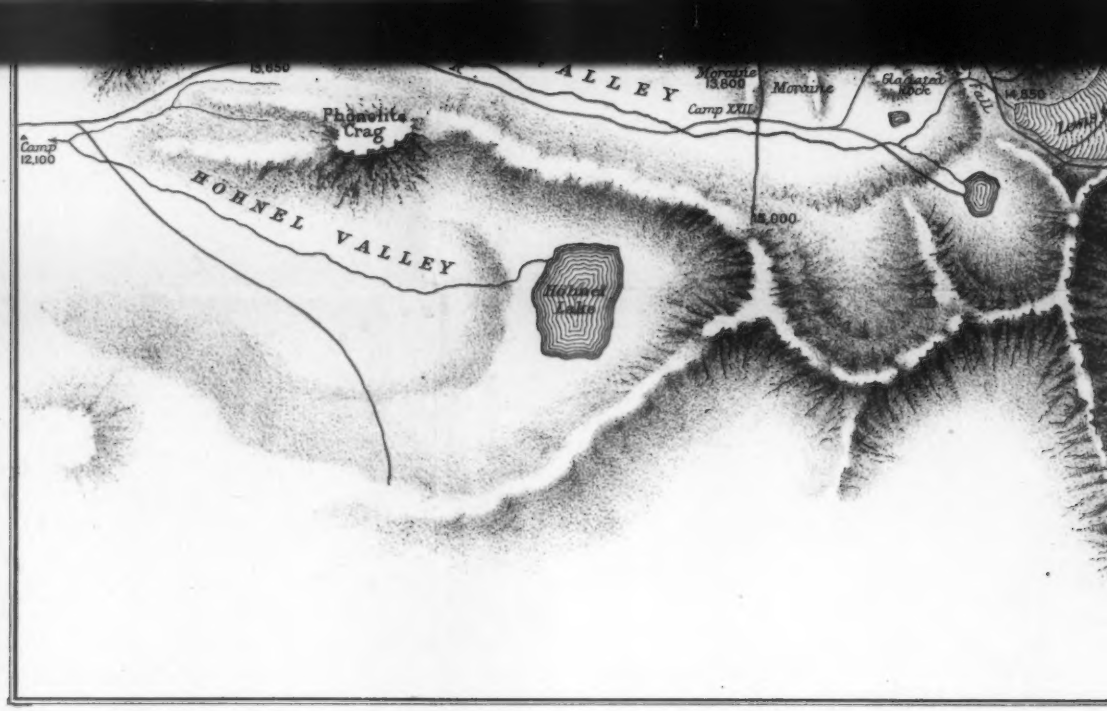
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

Published by the Royal Geog

Geographical Society.


MAGNETIC NORTH
VAR 7° 30 W.
HAUSBURG VALLEY
14,350
14,950
TELEKI VALLEY
Nairobi R.
Phonolite Col
13,650
Moraine
13,800
Camp XVII
Moraine
Glaciated Rock
14,850
Phonolite Crag
Camp
12,100
HÖHNEL VALLEY
13,000
Hatum's Lakes


SUMMIT OF
MOUNT KENYA
from a survey by
Mr H.J. MACKINDER
1899
Heights in feet. Route
MACKINDER VALLEY
HINDE VALLEY
Dry Lake beds
Sept. 16
14,050
14,300
Dry Lake beds
Buffalo Skeleton
14,200
Hall Tarn
14,150
Sept. 17
15,300
16,150
DRY GORGE
Michaelson Lake
12,700 (?)
VALLEY
14,100
14,800
15,800 (?)



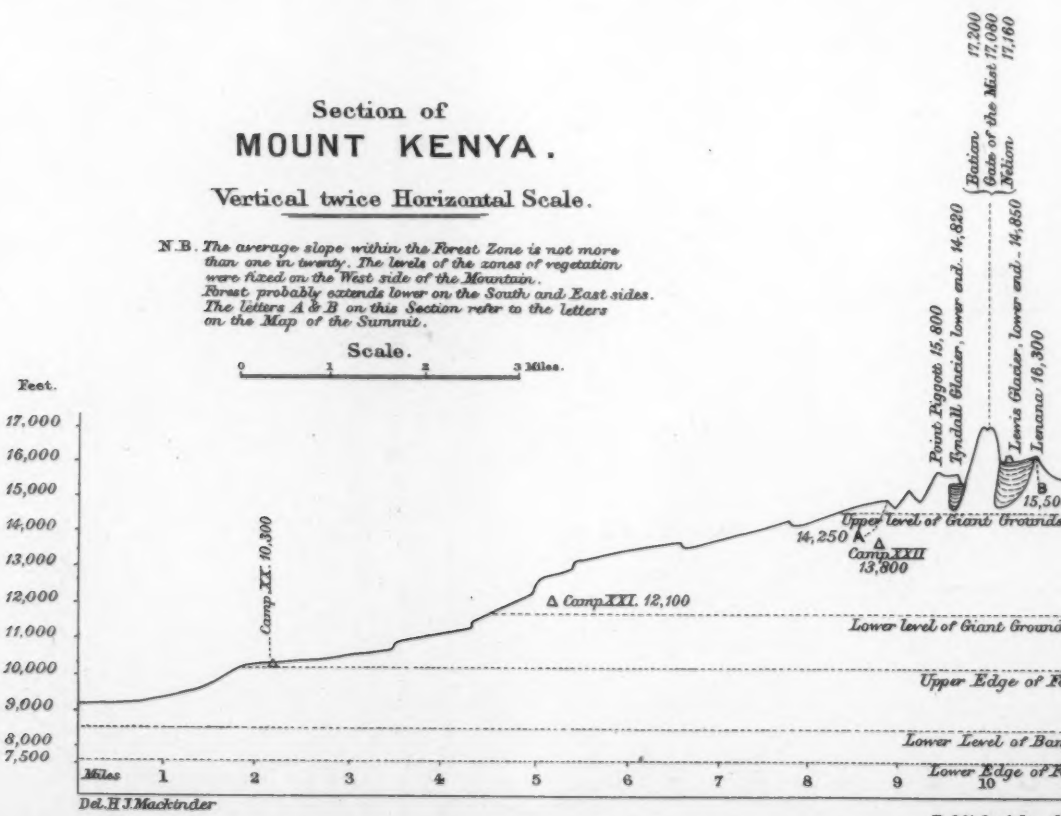
Section of
MOUNT KENYA.

Vertical twice Horizontal Scale.

N.B. *The average slope within the Forest Zone is not more than one in twenty. The levels of the zones of vegetation were fixed on the West side of the Mountain. Forest probably extends lower on the South and East sides. The letters A & B on this Section refer to the letters on the Map of the Summit.*

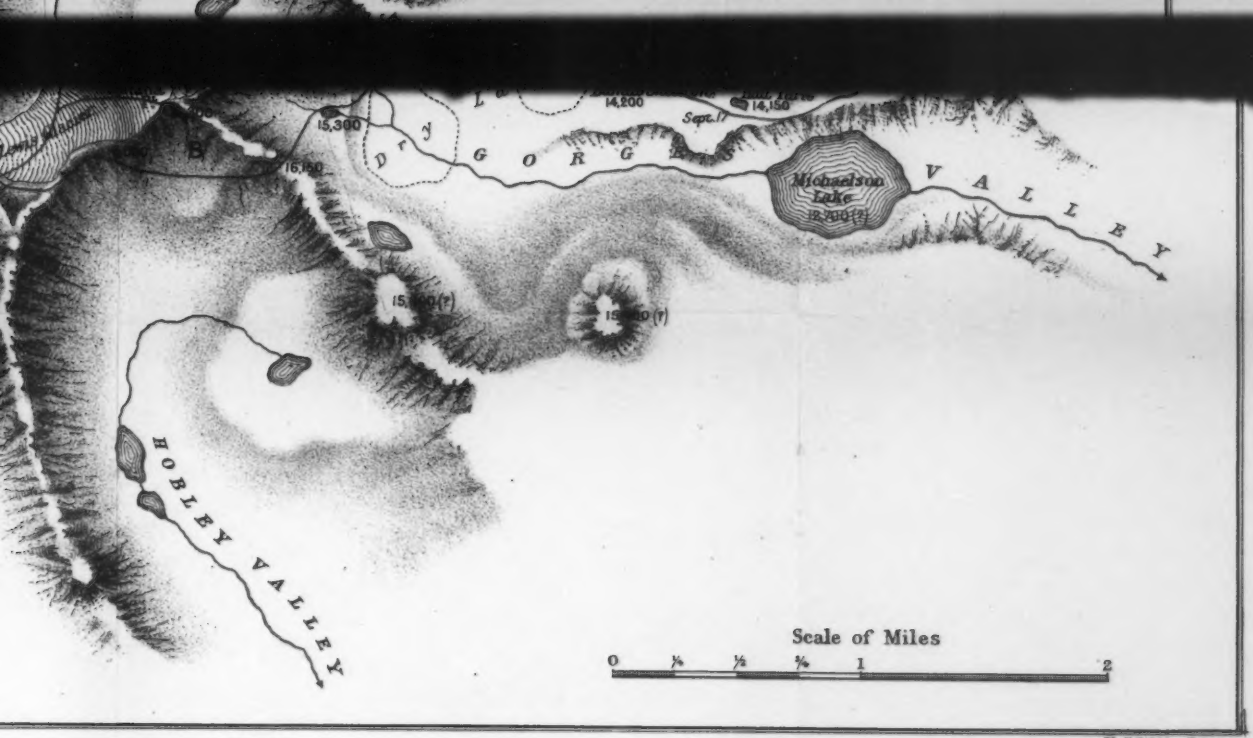
Scale.

0 1 2 3 Miles.

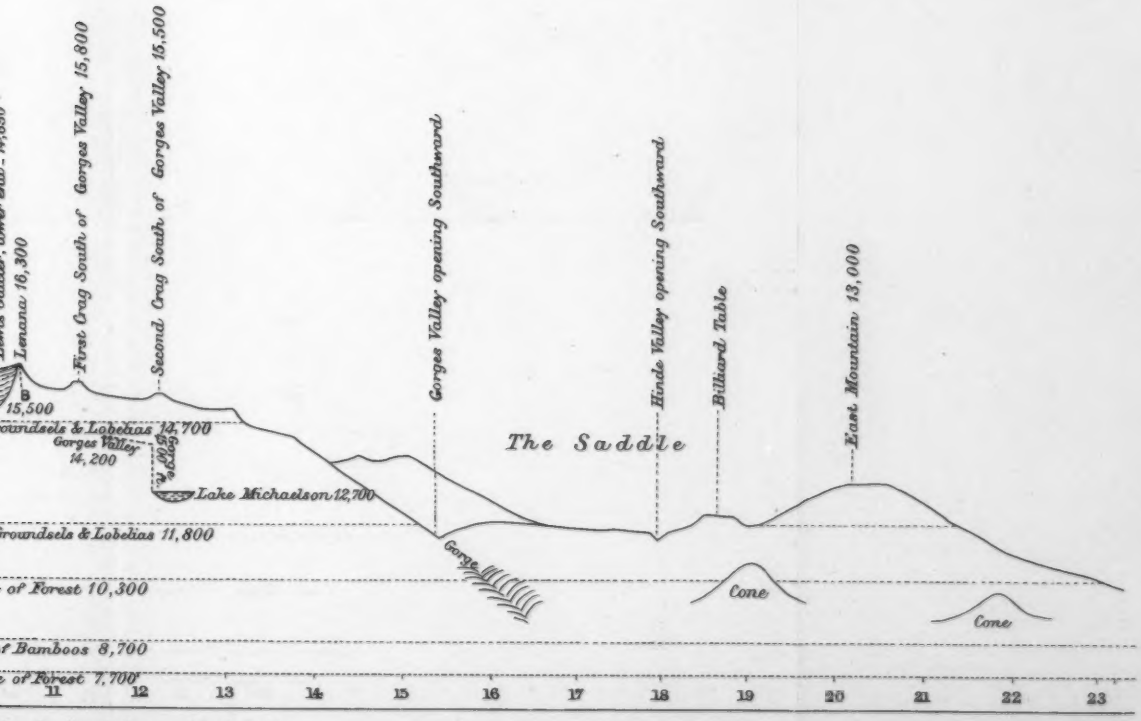


Del. H. J. Mackinder

Published by th



F.S.Weller F.R.G.S.



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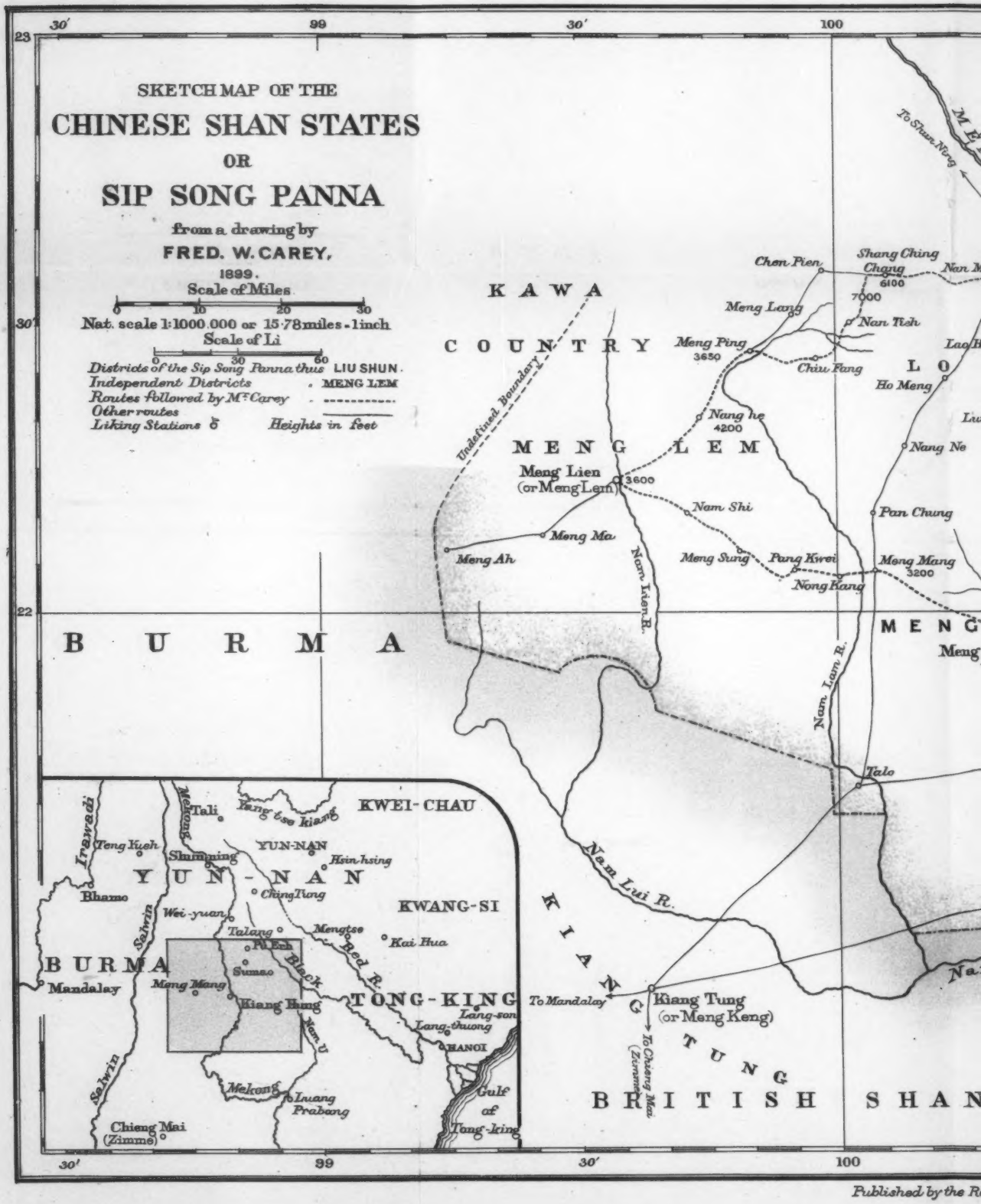

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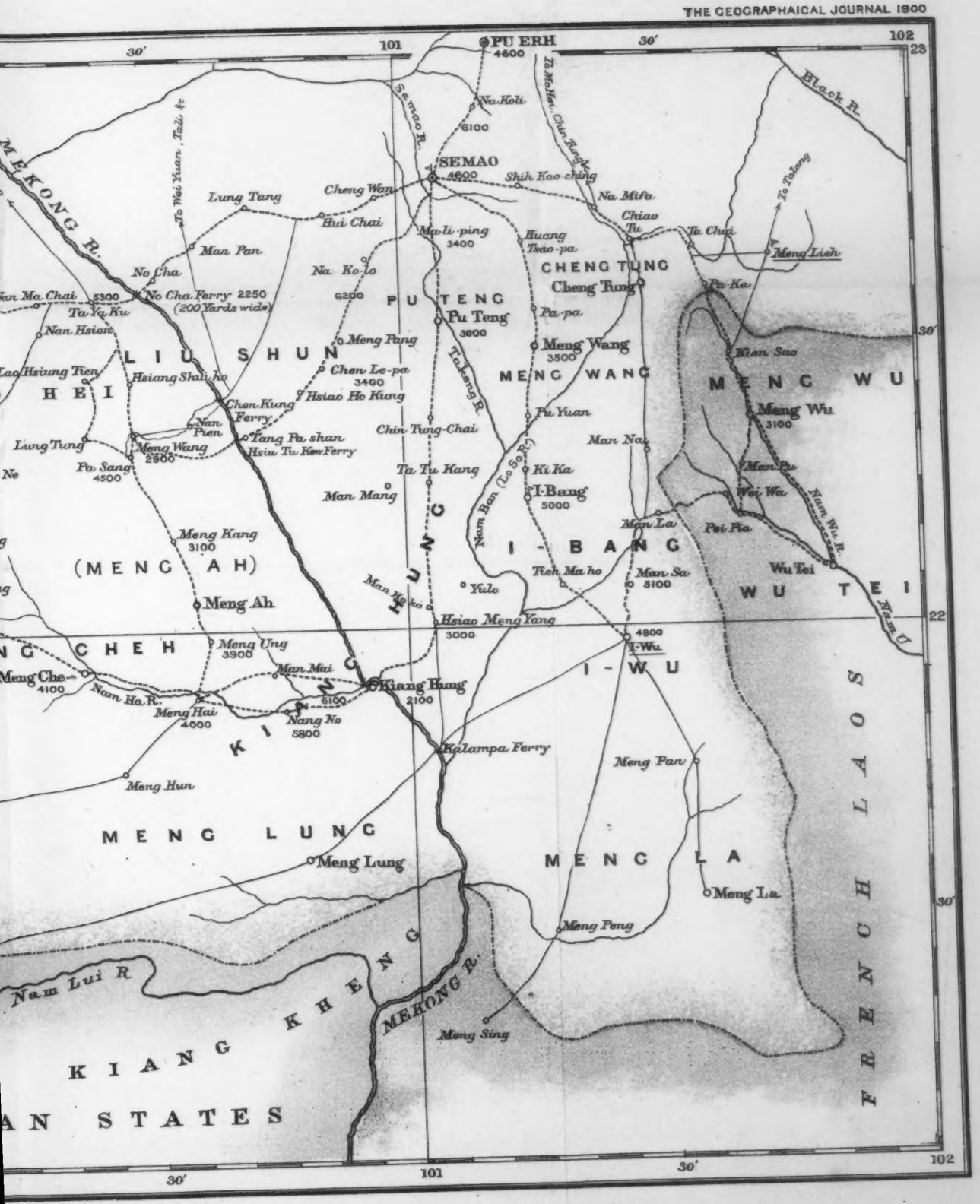

the Royal Geographical Society.

THE HIGHEST PART OF

THE CORDILLERA REAL
BOLIVIA

from a
Triangulation and plane table survey by
SIR MARTIN CONWAY
1898
and various unpublished documents.

Scale 500,000, or 7·89 miles = 1 inch
0 5 10 15 20 25

Height in feet *Route*

30'

68°

Chairobamba

Bella Vista

Río Cotacajes

Unipata

Cº Pilon

Sapucini

PROVINCE OF

LARECAJA

Cotanani

Illampu 21,275

Ancohuma 21,490

Challampaya

Challana 6967

Huaina Chulumani

Chachacomani 20,590

Cº d'Estacion 14,587

Isicani

Huancané

Zongo 5725

Santillani

Bella Vista

Condoriri

Pongo 12,697

Undavi

Cacacaca 20,320

Zongo Pass 13,796

Inconada

Chucuitaya Pass 15,275

Aillata

Chicani ?

Chililaya

Batallas

Río Batallas

Pucarani 12,645

Vilahaque

Vilabaque

Río Tuquia

THE PUNA

Río Desaguadero

Río Viacha

Viacha 12,534

La Ventilla

Cº Letanias

Tambo Coniri

Chucurusi Pass 13,475

Tomosa Pk 14,288

Calamarca 13,182

Okomasu

Yungayo

Quenco

Capiri

Callocollo

Río Seco

Río Desaguadero

Río Batallas

Río Cotacajes

Río Viacha

Río Huaina Chulumani

Río Quiquibey

Río Sapucini

Río Tuichi

Río Beni

Río Kaka

Río Kanuma

Río Kaluyo

Río Kaluyo Grande

Río Kaluyo Chico

Río Kaluyo Mayu

Río Kaluyo Pampa

Río Kaluyo Pampa Grande

Río Kaluyo Pampa Chico

Río Kaluyo Pampa Mayu

Río Kaluyo Pampa Pampa

Río Kaluyo Pampa Pampa Grande

Río Kaluyo Pampa Pampa Chico

Río Kaluyo Pampa Pampa Mayu

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Río Kaluyo Pampa

Río Kaluyo Pampa Grande

Río Kaluyo Pampa Chico

Río Kaluyo Pampa Mayu

Río Kaluyo Pampa

Río Kaluyo Pampa Grande

Río Kaluyo Pampa Chico

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Río Kaluyo Pampa

Río Kaluyo Pampa Grande

Río Kaluyo Pampa Chico

Río Kaluyo Pampa Mayu

Río Kaluyo Pampa

Río Kaluyo Pampa Grande

Río Kaluyo Pampa Chico

Río Kaluyo Pampa Mayu

Río Kaluyo Pampa

68°

30'

Rio Huanay or Caca

Huanay

Unipata

Pueblo Alonso

Sarcallo

Cª Piton

Carahuarani

Phuzuni

Tipuani

Sª Rosa

Rio Coroico

Rio Feroma

Sapucini

Carcuta

Zongochorro

Caranavi

R. Yara

Cotanani

Sª Anna

2608

Pauchinta

2306

Quiaraya

Rio Quiaraya

Rio Chitia

Firma

5768

Guarapata

Umapata

Rio Coroico

Huaina Chulumani

Loho

Quillo Quillo

Reinayata

Padilla

R. Bipuni

Sª Barbara

Sª Domingo

3835

Rachalaca

Isicani

Corvico

5650

Guarville

Barina

Zongo

5726

Santillani

Bella Vista

San Rafael

Undavi

Zongo

11.916

13.704

Huncanada

Chuquitaya?

Pass 15.275

Aillaico

Huajara?

Chicani?

Taquesi?

PROVINCE OF

LAS YUNGAS

Rio Undavi

PAZ

11.980

Mururata

18.980

LAMBATE

Pacuani

Pass 15.630

Palacoto

Palca Pª

Collana

ILLIMANI

21.180

Cusamaco

Mine

Laicacollo

Cohoni

Chuapalca

Tuni

13.910

Las Juntas

Tomosa Pª

14.288

Callesalla

Luribay

Santa Ana

(Mission)

R. Inigua

R. Mosere

R. Suturuma

R I O

Rio Ch

Longitude West of Greenwich.

30'

lished by the Royal Geographical Society.

67°

30'

16

30'

17

67°

B E N I

Chaco

Rio Cochabamba

Covendo
(Mission)

R. S. Felicidad

R. Leco

Porto Rico

R I O D E L P A Z O R O P E

Tiguani

R. Chaquite

S. José

Fortuno

La Asuncion

Rio Cajones

Rio Quiruni

Rio Peri

Coripata

Rio Tamanpaya

Rio Sorata

Rio Vacas

Chulumani

Rio Pari

Rio Salegana

Rio Chilcamaya

Irupana

Miguillo

Rio Miguillo

Chungamayo

Quimza Cruz
18,280

F. S. Weller, lith.